MG0302A

GMSK
Modulation Unit

Operation Manual

Fourth Edition

Read this manual after reading the Digital Modulation Signal Generator operation manual first. Keep it handy so that it can be read when necessary.

MP MASTER
MA35840

Measuring Instruments Division
Measurement Group

ANRITSU CORPORATION

MAR.
1996

Document: M-W0691AE-4.0

CE Marking

Anritsu affix the CE Conformity Marking on the following product (s) accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking

CE

1. Product Name/Model Name

Product Name: Digital Modulation Signal Generator, and Expansion Unit

Model Name: MG3670B, MG3671A, MG3660A, and MG03×

2. Applied Directive

EMC: Council Directive 89/336/EEC

3. Applied Standards

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

		Performance Crit
IEC801-2 (ESD)	4 kVCD, 8 kVAD	B
IEC801-3 (Rad.)	3 V/m	A
IEC801-4 (EFT)	1 kV	B

*: Performance Criteria

A: No performance degradation or function loss

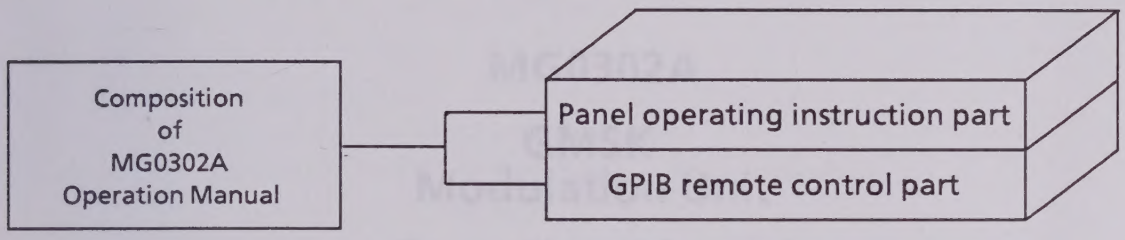
B: Self-recovered temporary degradation of performance or tem loss of function

MAR. 1996

ABOUT THIS MANUAL

(1) Composition of MG0302A Operation Manuals

The operation manual of the MG0302A (GMSK Modulation Unit) is composed of the following two parts. The related operations of the MG0303B (Burst Function Unit) are also explained. The term "MG3670 series" mentioned in this operation manual refers to both the MG3670B and the MG3671A. Substitute either name for the term as appropriate. Since operation manuals for the MG3670 series and the MG3660A are available as separate volumes, read them together with this manual.



Panel Operating Instructions part: Provides information on the MG0302A outline, preparation before use, manual (local) operation, measuremant, performance test, storage, transportation, screen transition, communication system, and error message.

GPIB remote control part: Provides information on the MG0302A remote control which conforms with IEEE488.2 standards. To assist creating GPIB programs, this part gives examples of N88 BASIC language programs that run on the NEC Corp. PC9800 series of personal computers.

(2) The relations between the installed units and the expanded functions

The MG0302A (GMSK Modulation Unit) and the MG0303B (Burst Function Unit) are expansion units, and are inserted in the MG3670 series • MG3660A Digital Modulation Signal Generator.

The relations between the installed units and the expanded functions are explained below:

Units installed	Modulation system	Modulation pattern	RF output
MG0302A only	GMSK Modulation • Bit rate: 72 kbps, Filter: BbT = 0.5 • Bit rate: 270.83 kbps, Filter: BbT = 0.3	• PN9/PN15-stage pseudorandom pattern • Free 4-bit repetition pattern	• Continuous wave
MG0302A + MG0303B	GMSK Modulation • Bit rate: 72 kbps, Filter: BbT = 0.5 • Bit rate: 270.83 kbps, Filter: BbT = 0.3	• PN9/PN15-stage pseudorandom pattern • Free 4-bit repetition pattern • Pattern conforming to the system	• Continuous wave • Burst wave

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MG0302A

GMSK
Modulation Unit

Operation Manual
(Panel Operating Instructions)

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SECTION 1
GENERAL

This section outlines the MG0302A GMSK Modulation Unit and explains the composition of this manual, the configuration of the MG0302A with the standard accessories, the related unit for expanding the MG0302A capabilities, and the MG0302A and MG0303B specifications.

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SECTION 1
GENERAL

1.1 Product Outline

The MG0302A GMSK Modulation Unit and the MG0303B Burst Function Unit are expansion units, and are installed in the MG3670 series • MG3660A Digital Modulation Signal Generator to generate the I/Q signals for GMSK modulation.

Installing the MG0302A enables outputting the modulation signals for communication systems including European mobile telephones (GSM: Global System for Mobile Telecommunication), European portable telephones (PCN: Personal Communication Network), and European digital cordless telephones (CT2: Cordless Telephone Second Generation).

Installing the MG0302A and the MG0303B enables outputting the burst signal based on each the communication-system channel format.

The table lists the model names of digital modulation signal generators (main instruments) capable of housing the MG0302A GMSK Modulation Unit and the MG0303B Burst Function Unit.

Model	Name	Remarks
MG3670B	Digital Modulation Signal Generator	MG3670 series
MG3671A	Digital Modulation Signal Generator	MG3670 series
MG3660A	Digital Modulation Signal Generator	
MG3670A†	Digital Modulation Signal Generator	Requires maintenance

† In order to combine the expansion units with the MG3670A, the MG3670A must be remodeled. Please contact your nearest Anritsu representative.

1.2 Composition of Operation Manual

This operation manual is composed of six sections. Each section is outlined below.

Section composition	Explanation
SECTION 1 GENERAL	Provides information about product outline, composition of manual, equipment configuration with standard accessories, related unit, and specifications
SECTION 2 BASIC OPERATION	Provides information about basic operation and auxiliary control signals
SECTION 3 DETAILED OPERATIONS	Provides information about operating communication systems and trigger function
SECTION 4 MEASUREMENT	Provides information about typical measurement examples for the digital mobile radio.
SECTION 5 PERFORMANCE TESTS	Provides information about equipment required for executing MG0302A performance tests, setup, and procedure of performance tests
SECTION 6 STORAGE AND TRANSPORTATION	Provides information about regular care and long-term storage as well as repacking and transportation

1.3 Equipment Configuration

This paragraph describes the configuration of the MG0301C π/4 DQPSK Modulation Unit and the related unit to expand the function.

1.3.1 Standard configuration

The table below shows the configuration of the MG0301C with the standard accessories:

Table 1-1 Standard Composition

Item	Model / Order No.	Name	Qty.	Remarks
Main instrument	MG0301C	π/4 DQPSK Modulation Unit	1	
Accessories	W0872AE	Operation manual	1	Involves the description of the MG0303B function related to the MG0301C

1.3.2 Unit

The table below shows the related units for the MG3670 series • MG3660A. (The MG0301C not included)

Table 1-2 Expansion Units

Modulation Units for Communication Systems:

Model No.	Name	System to be used
MG0302A	GMSK Modulation Unit	GSM, PCN, CT2
MG0305A	GFSK Modulation Unit	DECT
MG0307A	π/4 DQPSK Modulation Unit	PACS, WCPE, PHP

Burst Function Unit: used with the modulation units for Communication Systems

Model No.	Name	System to be used
MG0303B	Burst Function Unit	PDC[†1], PHP, NADC, TFTS, PDC_H[†2], CT2, GSM, PCN, DECT, PACS, WCPE

[†1] The full rate of Japanese Personal Digital Cellular system is expressed as PDC.

[†2] The half rate of Japanese Personal Digital Cellular system is expressed as PDC_H.

1.4 Specifications

The MG0301C and MG0303B specifications are listed in the following table.

1.4.1 MG0301C π/4 DQPSK Modulation Unit specifications

The MG0301C π/4 DQPSK Modulation Unit specifications are listed in Table 1-3.

Table 1-3 MG0301C π/4 DQPSK Modulation Unit Specifications

Applicable system	PDC, PHP, NADC, TFTS, PDC_H
Modulation system	π / 4 DQPSK
Vector error	I/Q signal: ≦1.5% rms (at 50 Ω output) RF signal: ≦1.8% rms (MG3670B/3671A, at ≦ +5 dBm output) ≦2.5% rms (MG3660A, at +5 dBm output)
Internal modulation data	Pseudorandom pattern: PN15/PN9 [Free 4-bit repetition pattern (ex: 1010, 1111)]
External modulation data	Data Clock: Covering ±5% of bit rate Data: Digital data synchronized with Data Clock Symbol Clock: Clock specified by Data synchronized with Data Clock [TTL level, BNC connector, polarity selectable]
I/Q signal output	Selectable 50 Ω or CMOS (600 Ω), BNC connector 50 Ω setting: 1 Vp-p ±2% (modulation data: 0000) CMOS setting: Variable in 10% steps over the 10% to 100% range of 1 Vp-p ±2% (modulation data: 0000) Variable offset voltage: 0 to 4 V (1 mV steps)
Adjacent channel leakage power ratio	For PHP system ≦ −74 dB: MG3670B/3671A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz ≦ −69 dB: MG3660A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz
PDC	Carrier frequency range: 300 kHz to 2250 MHz† Bit rate: 42 kbps Baseband filter: Root Nyquist: α=0.5, Nyquist: α=0.5
PHP	Carrier frequency range: 1 to 2250 MHz† Bit rate: 384 kbps Baseband filter: Root Nyquist: α=0.5, Nyquist: α=0.5
NADC	Carrier frequency range: 300 kHz to 2250 MHz† Bit rate: 48.6 kbps Baseband filter: Root Nyquist: α=0.35, Nyquist: α=0.35
TFTS	Carrier frequency range: 300 kHz to 2250 MHz† Bit rate: 44.2 kHz Baseband filter: Root Nyquist: α=0.4, Nyquist: α=0.4
PDC_H	Carrier frequency range: 300 kHz to 2250 MHz† Bit rate: 44.2 kHz Baseband filter: Root Nyquist: α=0.5, Nyquist: α=0.5

† The upper limit of carrier frequency conforms to the specification of the MG3670 series • MG3660A.

1.4.2 MG0303B Burst Function Unit specifications

Table 1-5 lists the MG0303B Burst Function Unit specifications for (GSM/PCN/CT2) when used with the MG0302A.

Table 1-4 MG0303B Burst Function Unit Specifications (1/2)

Applicable communication system		GSM, PCN (DCS1800), CT2 (with MG0302A)
Modulation signal	Internal data mode	TDMA framing specified for each system; modulation in each time slot using any Internal data mode
	Internal modulation data	Pseudorandom pattern: PN15/PN9†(for device) Specified pattern based on communication channel format specified for each system: Up/down communication channel, E section consists of pseudorandom pattern (PN15/PN9)†
	External data mode	Data Clock: Covering ±5% of bit rate Data: Digital data synchronized with Data Clock [TTL level, BNC connector, polarity selectable]
Auxiliary signal input	Burst trigger input	Outputs burst wave synchronized with trigger input signal of burst repetition. Input period: ≦burst repetition rate ±1 symbol TTL level, BNC connector (rear panel), polarity selectable
	Burst gate input	Outputs burst waveform corresponding to input signal width. Input signal width: ≧14 symbols, period: ≧22 symbols TTL level, BNC connector (rear panel), polarity selectable
Auxiliary signal output	Burst trigger output	Outputs 1-symbol width pulse at same cycle as burst waveform output. TTL level, BNC connector (rear panel), polarity selectable
	Pattern sync output	Following outputs selectable at internal modulation: PN Clock: Data clock corresponding to pseudorandom pattern part PN Gate: Gate signal corresponding to pseudorandom pattern part RF Gate: Signal for controlling pulse modulator in accordance with burst signal output TTL level, BNC connector (rear panel)
	Burst gate output	Outputs gate signal corresponding to burst waveform output at internal modulation. TTL level, BNC connector (rear panel), polarity selectable

† Pseudorandom pattern in each has different phase, and its pattern within the TCH segment of slots is continuous.

Table 1-4 MG0303B Burst Function Unit Specifications (2/2)

RF output	Burst on/off ratio	≧80 dB (MG3670B/3671A, +5 dBm output, CT2), ≧75 dB (MG3660A, +5 dBm output, CT2), ≧75 dB (+5 dBm output, GSM, PCN)
	Rise/fall time	Equivalent to 2 symbols
Memory	Pattern memory	100 patterns (store and recall of internal modulation pattern data)
GSM/PCN	Burst repetition period	4.615 ms
	Slot configuration	For device, normal burst (communication channel)
	Output slot select	On/off selectable for any slots of Slot 0 to Slot 7 (excluding all slots off)
	Edit function	TS: Any data, E: PN9/PN15† selectable
CT2	Burst repetition period	2 ms
	Slot configuration	Up/down communication channel (MUX 1.2, MUX 1.4, MUX 2)
	Edit function	D, B, Da, Db, CHM/SYNC data selectable
	Scramble function	B scramble on/off, any scramble code setting

† Pseudorandom pattern in each has different phase, and its pattern within the TCH segment of slots is continuous.

SECTION 2
BASIC OPERATION

This section describes basic operation procedures for the MG0302A GMSK Modulation Unit and the MG0303B Burst Function Unit and their auxiliary signals. See Section 3 on how to use the modulation patterns and trigger signals for each system.

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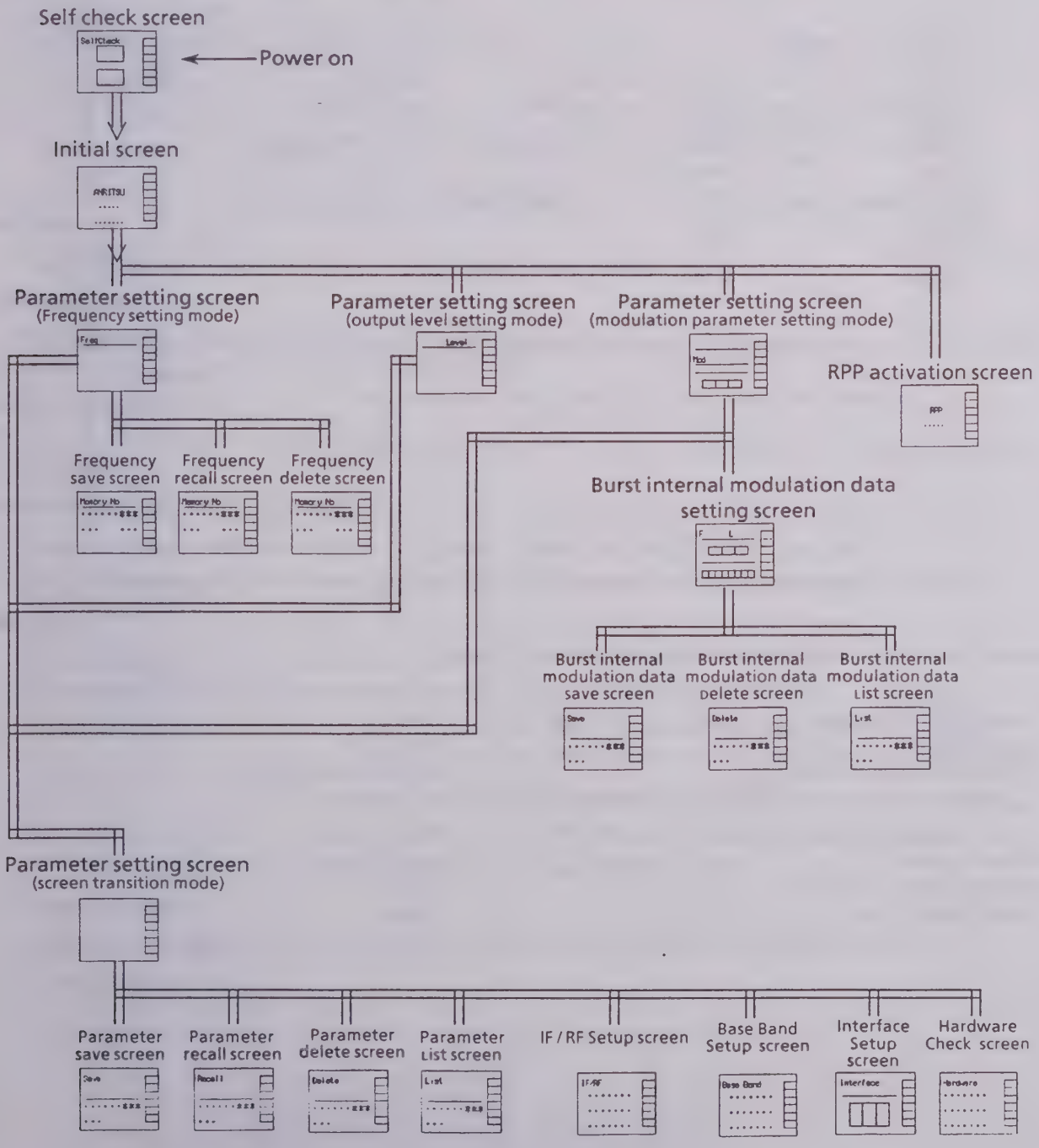
SECTION 2
BASIC OPERATION

2.1 Screen Transition

The display screen switches as shown below.

The screens appearing in this chapter are those for the MG3670B. The screens for the MG3671A/ MG3660A differ only in the model name indication in the top of the screen. Substitute the applicable model name for the model name in the screens.



2.2 Setting the Modulation Parameters

(1) Screen

When the Main Function section Mod key on the front panel is pressed, the parameter setting screen (modulation parameter setting mode) appears.

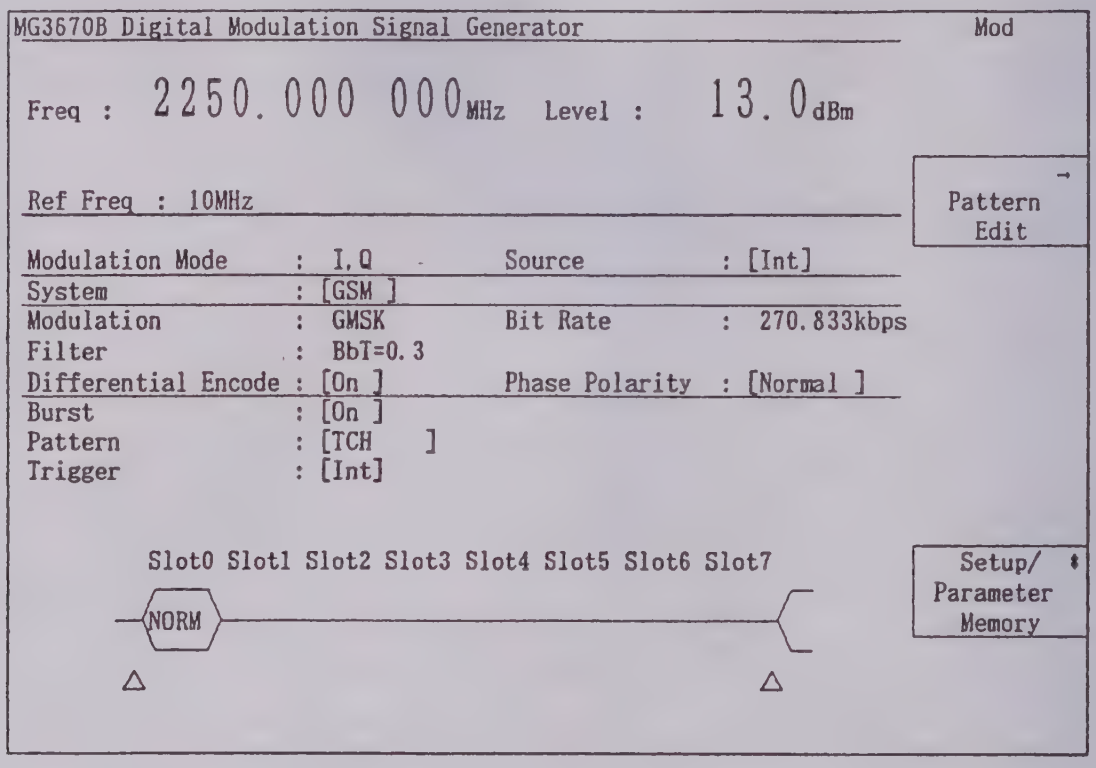

MG3670B Digital Modulation Signal Generator
Mod
Freq : 2250.000 000MHz Level : 13.0dBm
Ref Freq : 10MHz
Pattern Edit
Modulation Mode : I,Q Source : [Int]
System : [GSM]
Modulation : GMSK Bit Rate : 270.833kbps
Filter : BbT=0.3
Differential Encode : [On] Phase Polarity : [Normal]
Burst : [On]
Pattern : [TCH]
Trigger : [Int]
Slot0 Slot1 Slot2 Slot3 Slot4 Slot5 Slot6 Slot7
NORM
Setup/ Parameter Memory

Fig. 2-1 Parameter Setting Screen (modulation parameter setting mode)

Use the Cursor keys to set the following parameters in this screen.

- I, Q signal input ..... Source
- Communication system ..... System
- Baseband filter ..... Filter
- Differential encoding function ..... Differential Encode
  * Operable when either a GSM or PCN communication system is selected.

- Phase polarity selection function ..... Phase Polarity
- Burst function ..... Burst
- Internal modulation data ..... Pattern
- Burst trigger input ..... Trigger

(2) Setting parameters

■ Source (Int / Ext)

Sets the I, Q signals to internal (Int) or external (Ext).

Initial setting: Int

■ System

The communication system can be set to GSM, PCN, or CT2. When the communication system is selected, the modulation method, BbT product, and bit rate are set as shown below.

Initial setting: GSM (does not affect the Preset key)

Communication system	Modulation method	BbT product	Bit rate
GSM	GMSK	BbT = 0.3	270.833 kbps
PCN	GMSK	BbT = 0.3	270.833 kbps
CT2	GMSK	BbT = 0.5	72 kbps

■ Filter

The BbT product is fixed according to the communication system.

■ Differential Encode

The differential encoding function can be turned on or off. The communication system must be either GSM or PCN. (See Section 2.8 for more details.)

■ Phase Polarity

The polarity of phase changes relative to modulation data can be selected. (See Section 2.9 for more details.)

■ Burst (On / Off)

The burst function can be set to On when a burst function unit (MG0303B) is installed.

Initial setting: Off

■ Pattern

The following internal modulation data can be set:
When data of BaseBand Setup screen is externally input, Pattern is not displayed.

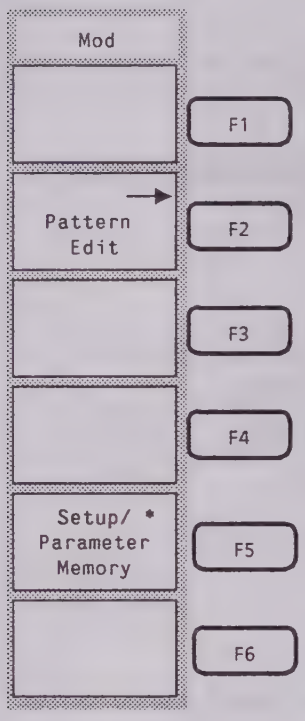
- When the burst function is on: Standard internal modulation data of each communication system
  (For details on the internal modulation data of each communication system, see Section 3.)
  Data stored in the internal modulation data memory (For details, see 2.4 Internal modulation data memory)
- When burst function is off: PN9, PN15 and any 4-bit data (0000 to 1111)

■ Trigger (Int / Ext)

Sets the burst trigger to either internal (Int) or external (Ext) when the burst function is on.

Initial setting: Int

(3) Function keys



F1	
F2	Switches to the internal modulation data setting screen. This function key is displayed when the burst function is on.
F3	
F4	
F5	Switches to the screen transition mode.
F6	

2.3 Setting Internal Modulation Data

(1) Screen

The internal modulation data setting screen is displayed when the 'Pattern Edit' F2 soft key shown in the parameter setting screen (modulation parameter setting mode) is pressed while the burst function is on.

The standard internal modulation data set in Pattern in the modulation parameter setting screen is displayed in this screen.

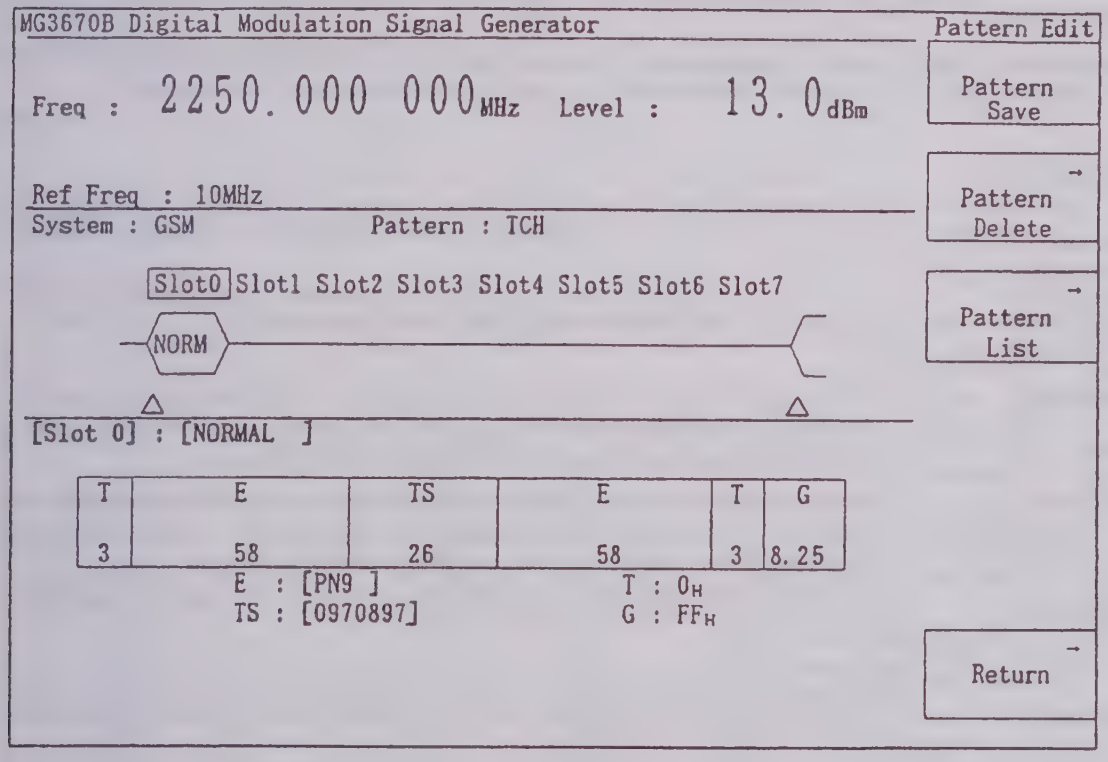


Fig. 2-2 Internal Modulation Data Setting Screen (GSM system)

Note: *The internal modulation data cannot be set if there is no burst function unit (MG0303B) installed.*

(2) Set parameters

■ Slot number

Selects the numbers of the desired slots.

GSM: Slot 0 to Slot 7
PCN: Slot 1 to Slot 7
CT2: Slot 0 to Slot 1

Note: *For the CT2 system, the slot number selection is performed by the up/down communication channel selection of the pattern selection, so this slot number setting is not required.*

■ Slot

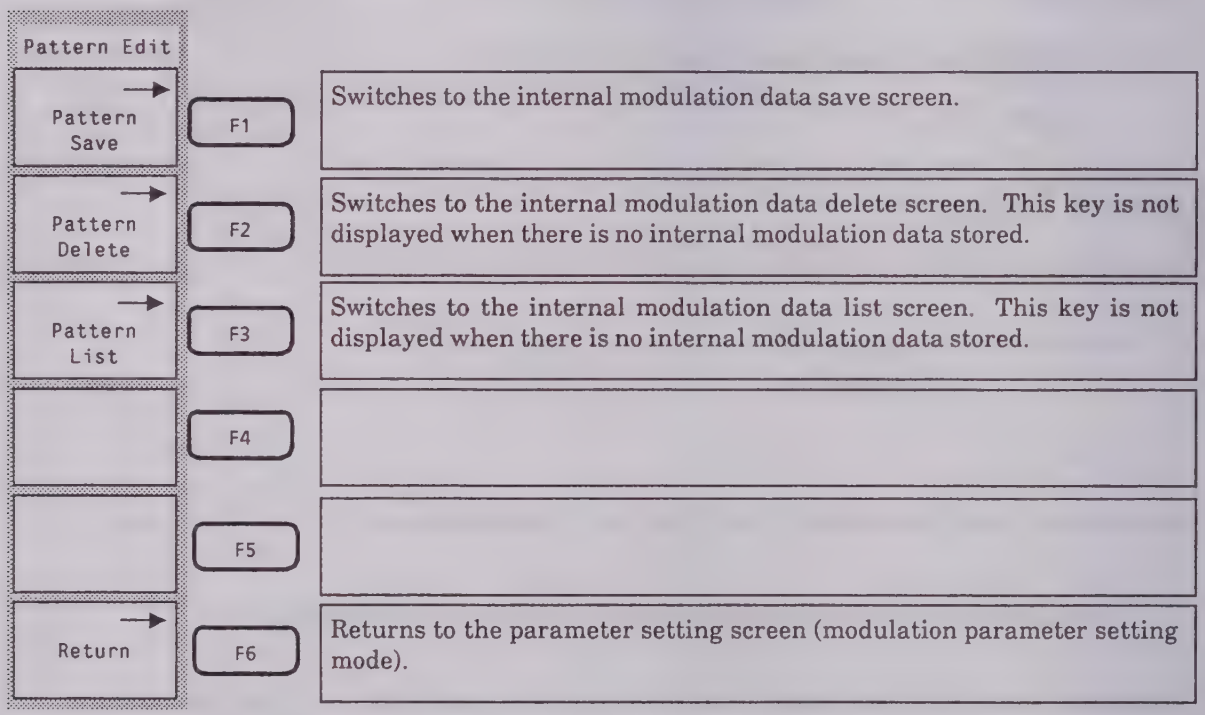
Selects the applicable slot. The selectable slot depends on the standard internal modulation data set in Pattern of each communication system. For details on the internal modulation data of each communication system, see Section 3.

Note: *For the CT2 system, the slot selection is performed by the pattern setting, so this slot setting is not required.*

■ Modulation data

Sets the modulation data of a slot. The selectable types and ranges of modulation data differ from slot to slot. For details on the internal modulation data of each communication system, see Section 3.

(3) Function keys


Pattern Edit
Pattern Save
F1
Switches to the internal modulation data save screen.
Pattern Delete
F2
Switches to the internal modulation data delete screen. This key is not displayed when there is no internal modulation data stored.
Pattern List
F3
Switches to the internal modulation data list screen. This key is not displayed when there is no internal modulation data stored.
F4
F5
Return
F6
Returns to the parameter setting screen (modulation parameter setting mode).

2.4 Internal Modulation Data Memory

Modulation data set in the internal modulation data setting screen can be stored into, retrieved, deleted and listed from memory. Each of the memory operations are discussed in detail below.

2.4.1 Saving internal modulation data

When the 'Pattern Save' F1 soft key is pressed in the internal modulation data setting screen, the internal modulation data save screen appears. Specify the memory location number using the data keys, rotary knob, Step keys or Cursor keys and press the Set or Enter key to store the set data.

Memory location number range: 0 to 99

(1) Screen

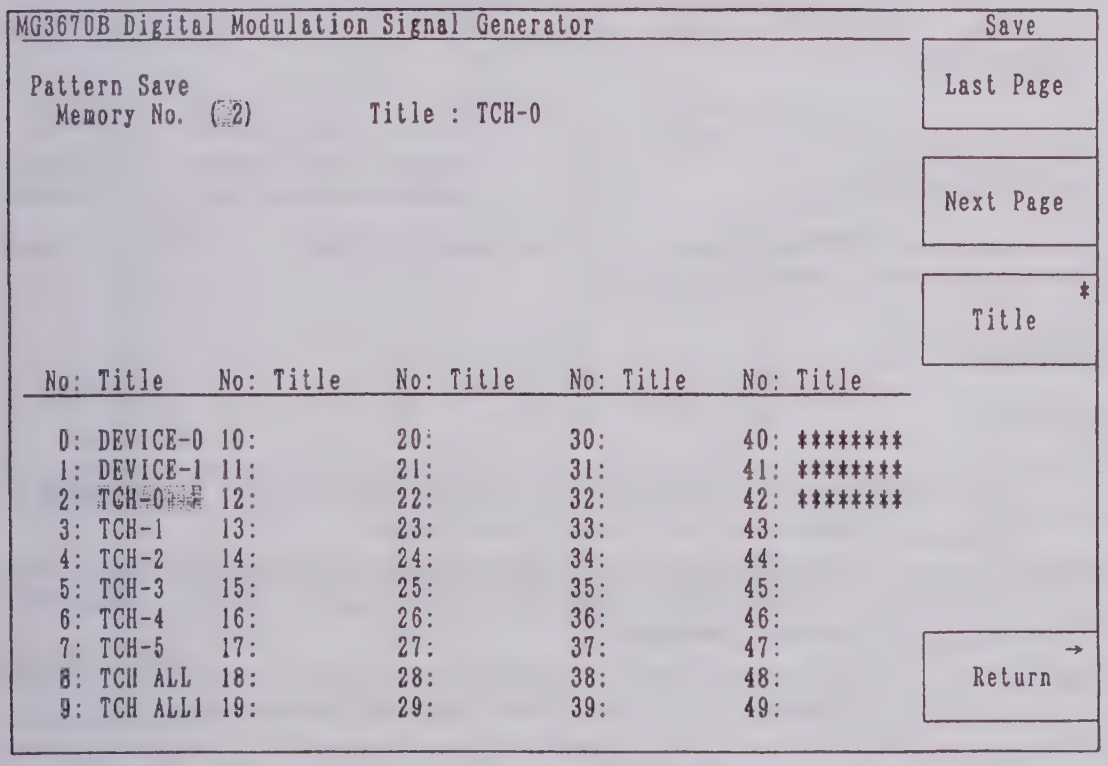


Fig. 2-3 Internal Modulation Data Save Screen

Initial memory location number: Currently available location having the smallest number

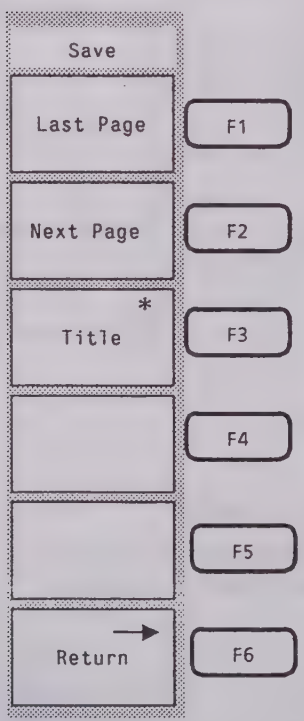
If data is already stored in the specified location, a Yes/No window appears for confirmation purposes. Press the Set key to overwrite the current data. After storing the data, the internal modulation data setting screen is redisplayed.

Example: Stores modulation data in memory location 10.

Step	Action	Verification
1	Mod†	Sets the modulation parameter setting mode and lights the Mod key's LED indicator.
2	Pattern Edit F3	Displays the internal modulation data setting screen.
3	Pattern Save F1	Displays the internal modulation data saving screen.
4	1 0 Set	Specifies memory location 10 and stores internal modulation data in that location.

† There is no need to press the Mod key if its indicator is already lit.

(3) Function keys



F1	Displays the previous page of the current data list. No operation is performed when there is no previous page.
F2	Displays the next page of the current data list. Nothing is done when there is no next page.
F3	Displays the title input window and related function keys.
F4	
F5	
F6	Returns to the internal modulation data setting screen.

■ Inputting a title

A title up to eight characters long can be entered when storing internal modulation data. "********" is displayed in the title field when no title is specified.

(1) Screen

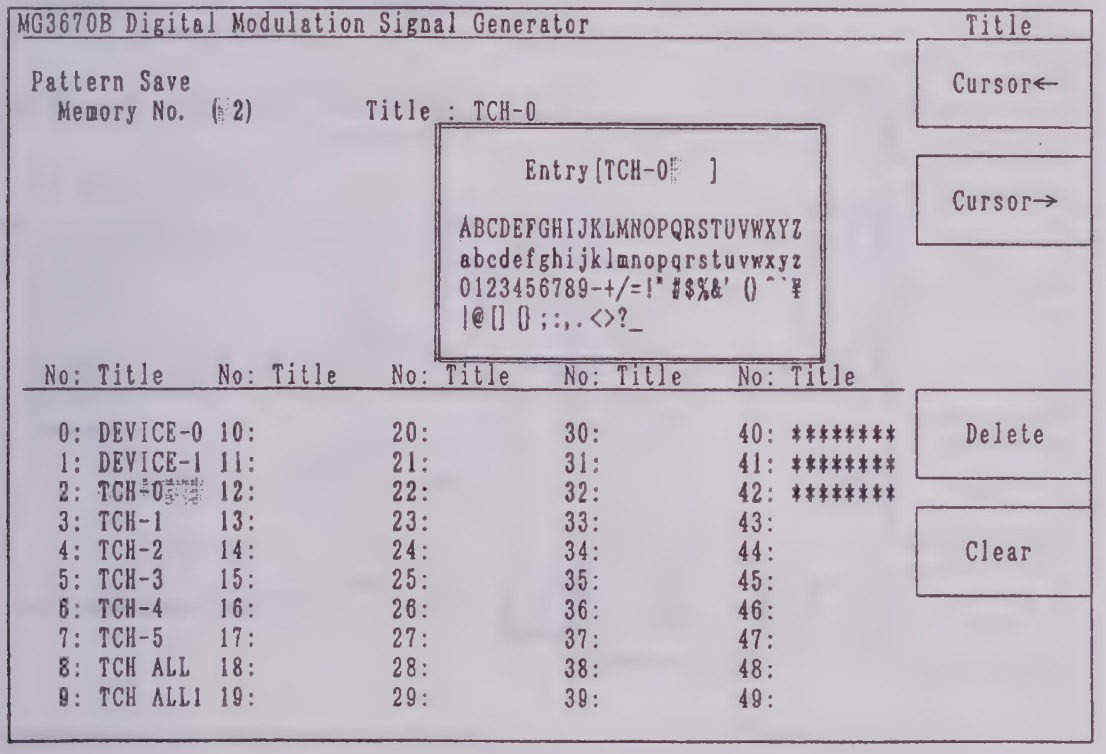
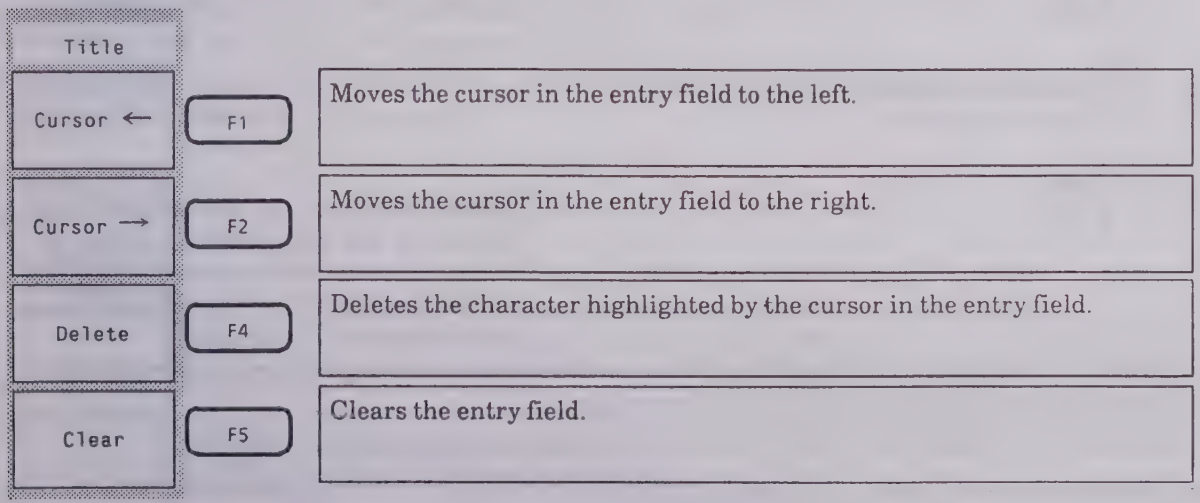


Fig. 2-4 Internal modulation data save screen (title input window)

(2) Function keys



Example : Inputs the title 'Anritsu'.

Step	Action	Verification
1	Mod †	Switches to modulation parameter setting mode and lights the Mod key's LED indicator.
2	Pattern Edit F2	Switches to the internal modulation data setting screen.
3	Pattern Save F1	Switches to the internal modulation data save screen.
4	Title F3	Opens the window for setting the title.
5	Clear F5	Clears the title entry field.
6	Cursor ← F1 , Cursor → F2	Moves the cursor within the entry field.
7	Cursor keys or rotary knob	Selects the characters from the character list.
8	Enter	Enters the selected character in the Entry field.
9	BS	Deletes an erroneously entered character.
10	Repeat steps 6, 7 and 8 until 'Anritsu' is completely entered.	
11	Set	Closes the title input window after inputting the title. (After inputting the title, specify the memory location number where internal modulation data will be stored.)

† There is no need to press the Mod key if its LED indicator is already on.

Note: *The title can also be entered using the data keys.*

2.4.2 Recalling internal modulation data

Data saved in the internal modulation data save screen can be retrieved through the Pattern setting in the parameter setting screen (modulation parameter setting mode).

(1) Screen

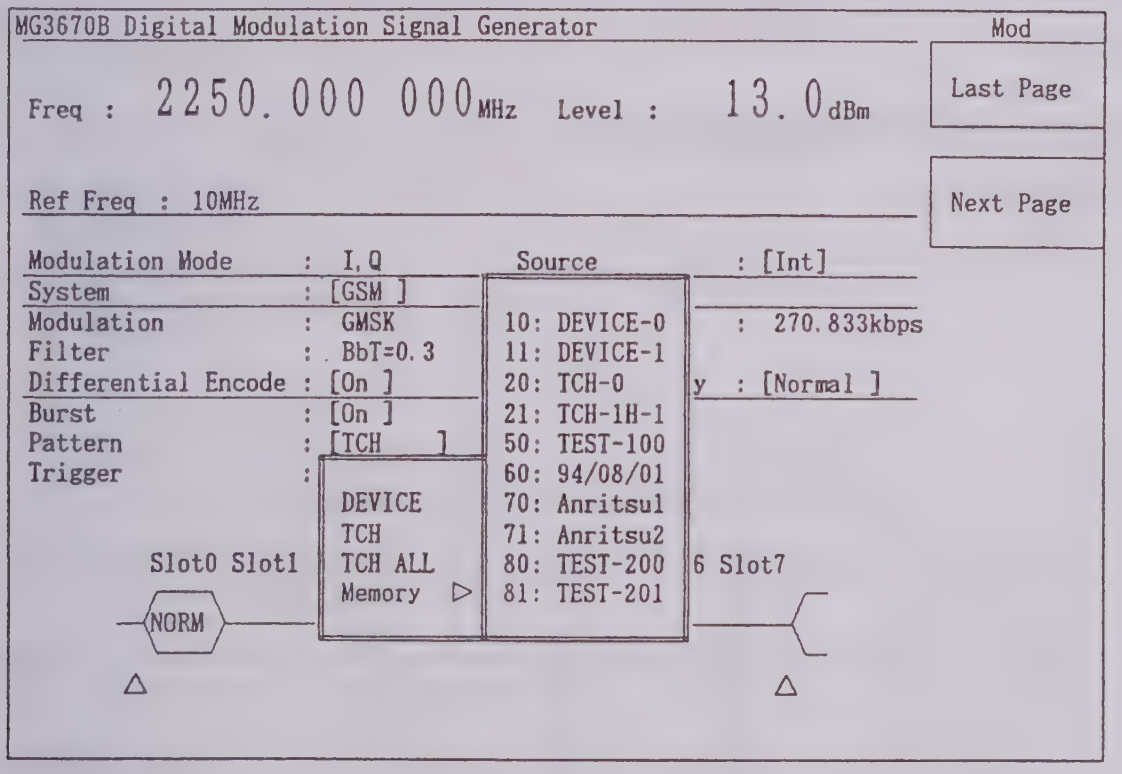
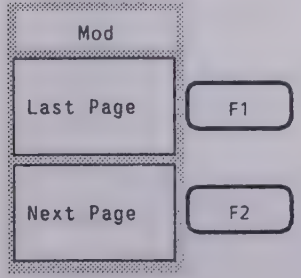


Fig. 2-5 Parameter Setting Screen (modulation parameter setting mode, Pattern setting window)

If internal modulation data is stored in memory, 'Memory▷' is displayed in the Pattern setting window in the parameter setting screen (modulation parameter setting mode). When this is selected, a sub-window opens and data stored in memory are displayed.

When the Set key is pressed and the pattern selected, both windows close simultaneously. Press the Cancel key to close the sub-window only.

(2) Function keys



Last Page (F1)	Displays the previous page in the sub-window. No operation is performed when there is no previous page.
Next Page (F2)	Displays the next page in the sub-window. No operation is performed when there is no previous page.

2.4.3 Deleting internal modulation data

When the 'Pattern Delete' F2 soft key is pressed in the internal modulation data setting screen, the internal modulation data delete screen appears. Use the data keys, rotary knob, Step keys and Cursor keys to specify the memory number and then press the Set and Enter keys. A Yes/No window then appears for verification. Select Yes to delete the data.

Initial memory location number: Currently saved memory location having the smallest number

(1) Screen

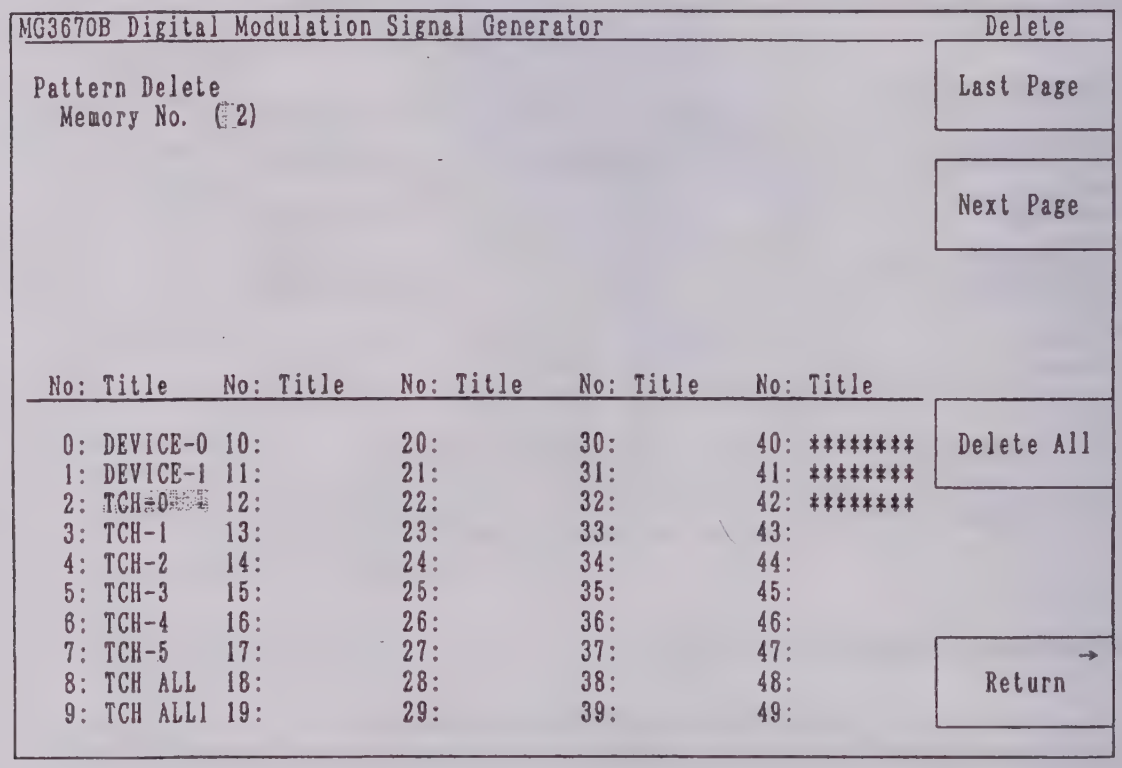

MG3670B Digital Modulation Signal Generator
Delete
Pattern Delete
Memory No. (2)
Last Page
Next Page
No: Title No: Title No: Title No: Title No: Title
0: DEVICE-0 10: 20: 30: 40: ********
1: DEVICE-1 11: 21: 31: 41: ********
2: TCH-0 12: 22: 32: 42: ********
3: TCH-1 13: 23: 33: 43:
4: TCH-2 14: 24: 34: 44:
5: TCH-3 15: 25: 35: 45:
6: TCH-4 16: 26: 36: 46:
7: TCH-5 17: 27: 37: 47:
8: TCH ALL 18: 28: 38: 48:
9: TCH ALL1 19: 29: 39: 49:
Delete All
Return

Fig. 2-6 Parameter Setting Screen (modulation parameter setting mode, pattern data deletion)

To delete all data in memory, press the 'Delete All' F4 soft key. 'All' is displayed in the memory number field and all data set in the list are reversely highlighted. A Yes/No window then appears for verification purposes. Press Yes to delete all of the data sets.

Example: Deletes the internal modulation data in memory location 10.

Step	Action	Verification
1	Mod†	Switches to the modulation parameter setting mode and the Mod key's LED indicator lights.
2	Pattern Edit, F2	Switches to the internal modulation data setting screen.
3	Pattern Delete, F2	Switches to the internal modulation data delete screen.
4	1, 0, Set	Specifies memory location 10. (A Yes/No window opens for verification.)
5	Cursor <, Set	Select Yes to delete the data.

† There is no need to press the Mod key if its indicator is already lit.

(2) Function keys

Delete

Last Page	F1	Displays the previous page of the current data list. No operation is performed when there is no previous page.
Next Page	F2	Displays the next page of the current data list. Nothing is done when there is no next page.
	F3	
Delete All	F4	Deletes all data stored in memory.
	F5	
Return →	F6	Returns to the internal modulation data setting screen.

2.4.4 Listing internal modulation data

When the 'Pattern List' F3 soft key is pressed in the internal modulation data setting screen, the internal modulation data list screen appears. Use the data keys, rotary knob, Step keys and Cursor keys to specify the memory location number and then press the Set or Enter key to display in a window the internal modulation data stored in that location.

Initial memory location number: Currently saved memory location having the smallest

(1) Screen

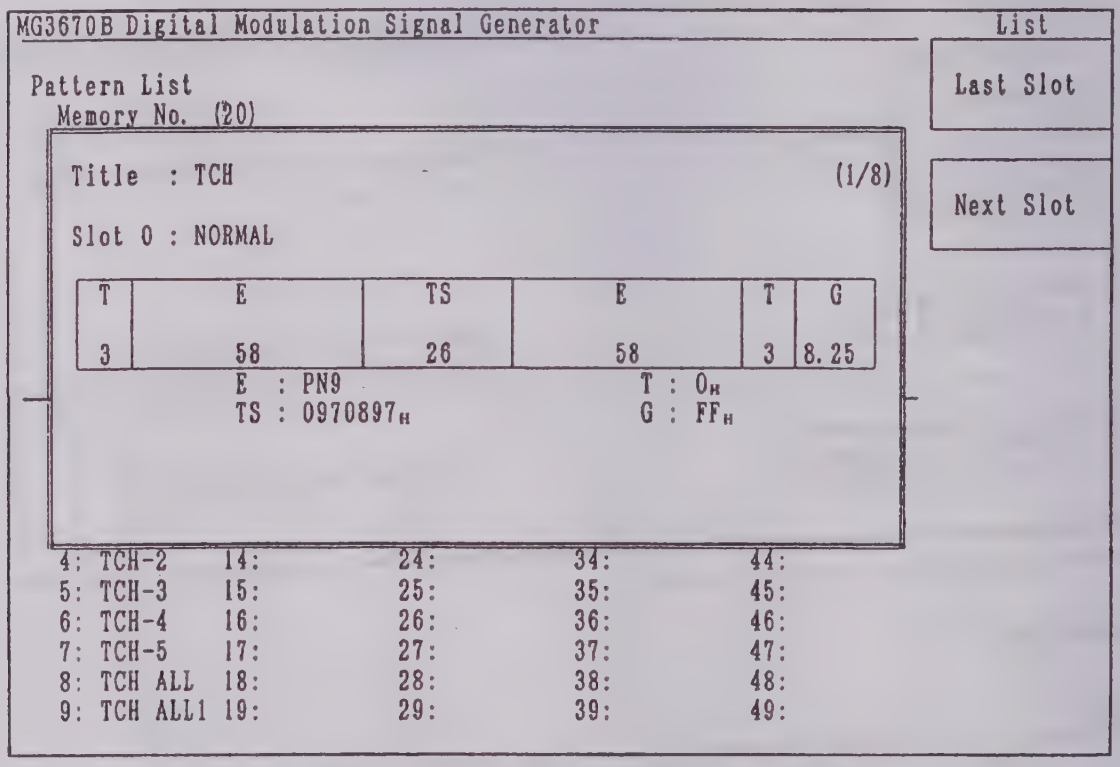
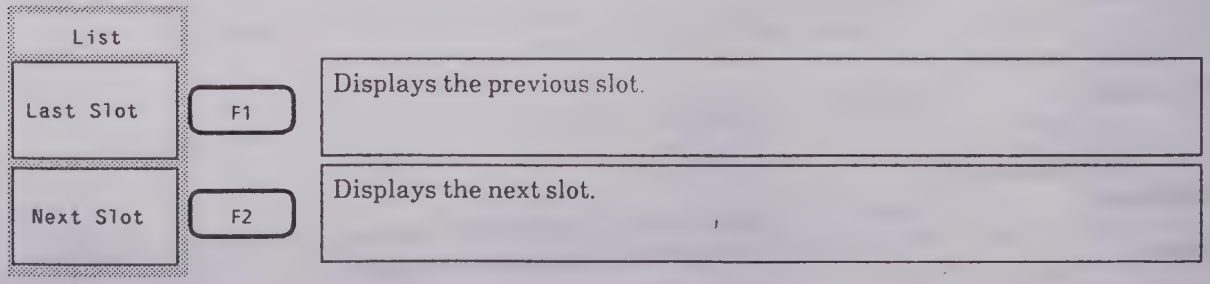


Fig. 2-7 Internal Modulation Data List Screen

Internal modulation data is displayed per slot; Use the 'Last Slot' F1 and 'Next Slot ' F2 soft keys to select the slot. Press the Set or Cancel key to close the window.

(2) Function keys



2.5 I, Q Signal Outputs

The I, Q signal outputs are always produced regardless of the I, Q modulation signal source setting (Int or Ext). The I, Q signals are described as follows:

Setting		I, Q signal output
Modulation	Source	
On	Int	Outputs I, Q signals corresponding to the currently set modulation.
	Ext	Outputs I, Q signals immediately before the source is set to Ext.
Off	——	Outputs a DC voltage signal for non-modulated signals.

Note: *Only the DC voltage signal for non-modulated signals is output for models that are not equipped with a modulation unit.*

(1) Setting the output level

The output level can be set within the range shown in the table below. However, the input and output settings will be the same. For details, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.

I, Q Level	Impedance		Input / Output level	Offset voltage
	Input	Output		
50 Ω 500 mV selected	50 Ω	50 Ω	500 mVrms (Fixed)	0 mV (Fixed)
CMOS selected	100 kΩ	600 Ω	50 to 500 mVrms , 50 mVrms step	0 to 4000mV, 1 mV step

■ **Defining the output levels of the I and Q signals:**

Output level is $\sqrt{I^2 + Q^2}$ for '0000' pattern, terminated voltage;

terminated impedance is as follows:

When 50 W, 500 mV is selected: 50 Ω
When CMOS is selected: 600 Ω

Note: *For details on the I, Q signals input level, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.*

(2) I, Q output balance, offset and phase adjustment functions

When the I, Q output trimmer function is set to On, the adjustment function is activated. For details on the setting method, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.

■ Balance adjustment function

The balance adjustment function fixes the amplitude of the Q signal and varies the amplitude of the I signal within ±20%.

■ Offset adjustment function

The offset adjustment function adds an offset voltage ranging within ±0.1 V to the I, Q output signals. (The I signal offset voltage can be independently adjusted from the Q signal offset voltage.)

■ Phase adjustment function

The phase adjustment function shifts the phase of the I signal within a ±10° range. This shift operation can be expressed in an equation as follows:

$I_{OUT} = I \cdot \cos\theta + Q \cdot \sin\theta$

$Q_{OUT} = Q$

I_{OUT}: I signal output when the I, Q signal adjustment function is On

Q_{OUT}: Q signal output when the I, Q signal adjustment function is On

I: I signal output when the I, Q signal adjustment function is Off

Q: Q signal output when the I, Q signal adjustment function is Off

θ: Phase shift angle; Can be varied within ±10° with the trimmer

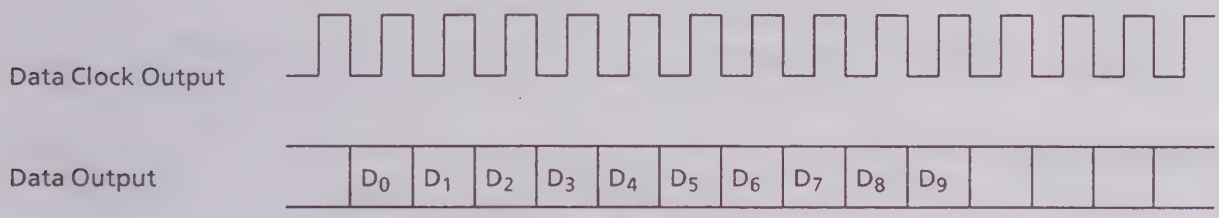
Note: *The functions described above cannot be independently set On or Off.*

2.6 Auxiliary signal outputs

This section explains the control signals output from the MG3670 series • MG3660A rear panel. For details on the IQ DC offset, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.

2.6.1 Data and data clock signals

The output timings of the Data and Data Clock signals are shown below. In the figure, the polarities of the signals are expressed as positive or rising edge.



Note: *For the GMSK modulation, one-bit data consists of one symbol, the symbol clock is not required.*

2.6.2 Pattern sync signal

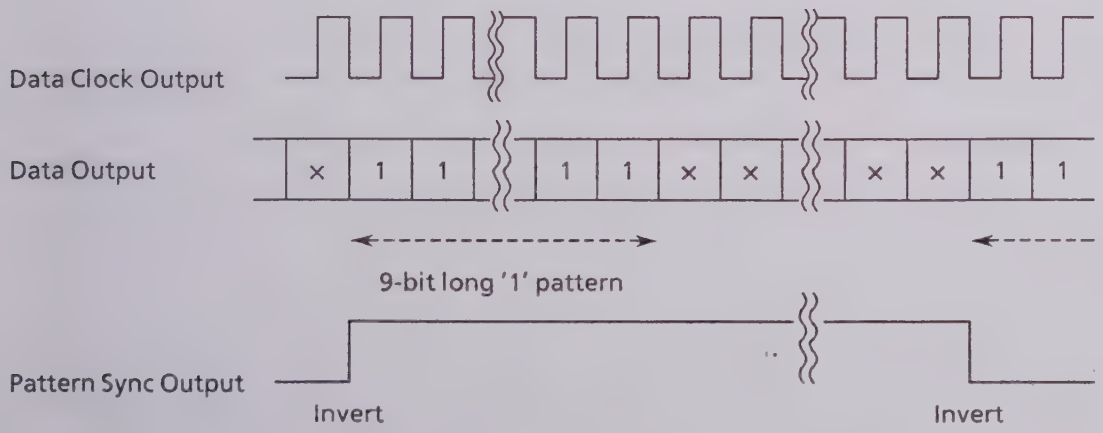
The Pattern Sync Output signal that is produced depends on whether the burst function is On or Off. This is explained as follows:

(1) When burst function is Off:

When burst function is Off, the Pattern Sync Output signal allows a signal synchronized with the output pattern to be output.

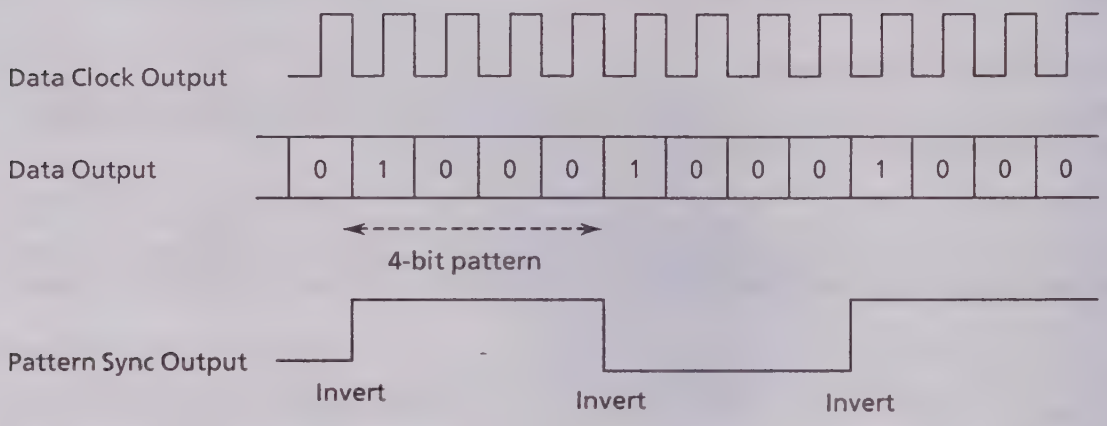
■ When PN pattern is selected

When PN9 is selected, an invert signal is output at the beginning of a pattern consisting of nine contiguous '1' bits. When PN15 is selected, an invert signal is output at the beginning of a pattern consisting of fifteen contiguous '0' bits. The output signal when PN9 is selected is shown below:



■ When 4-bit pattern is selected:

An invert signal is output at the beginning of the 4-bit pattern. The figure is based on a '1000' 4-bit pattern.



(2) When the burst function is On

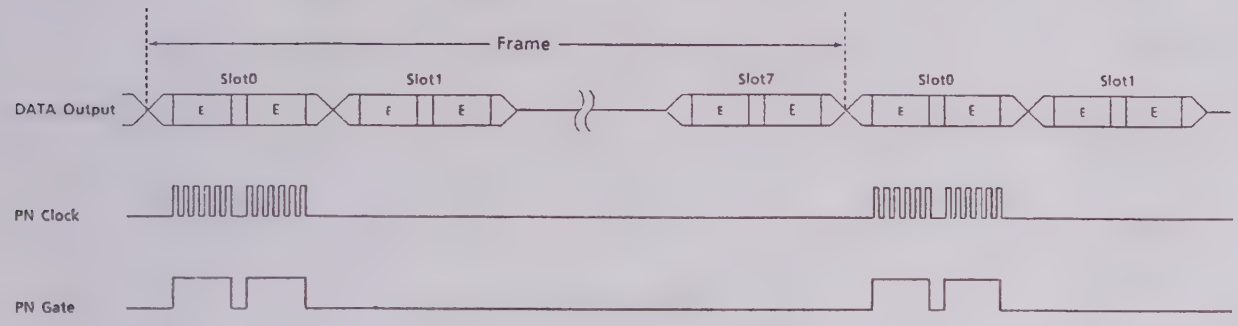
When the burst function is on, the Pattern Sync Output signal allows a control signal synchronized with the frames to be output.

■ When the PN clock is selected

The clock signal of the pseudorandom pattern of the first output slot in the frame is output.

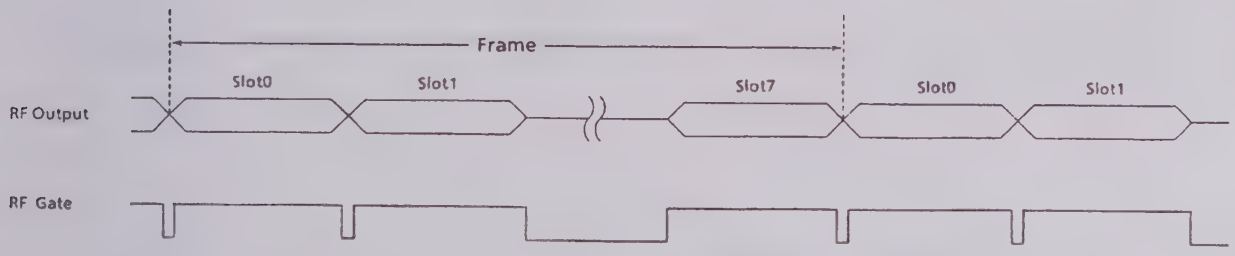
■ When the PN gate is selected

The gate signal of the pseudorandom pattern of the first output slot in the frame is output.

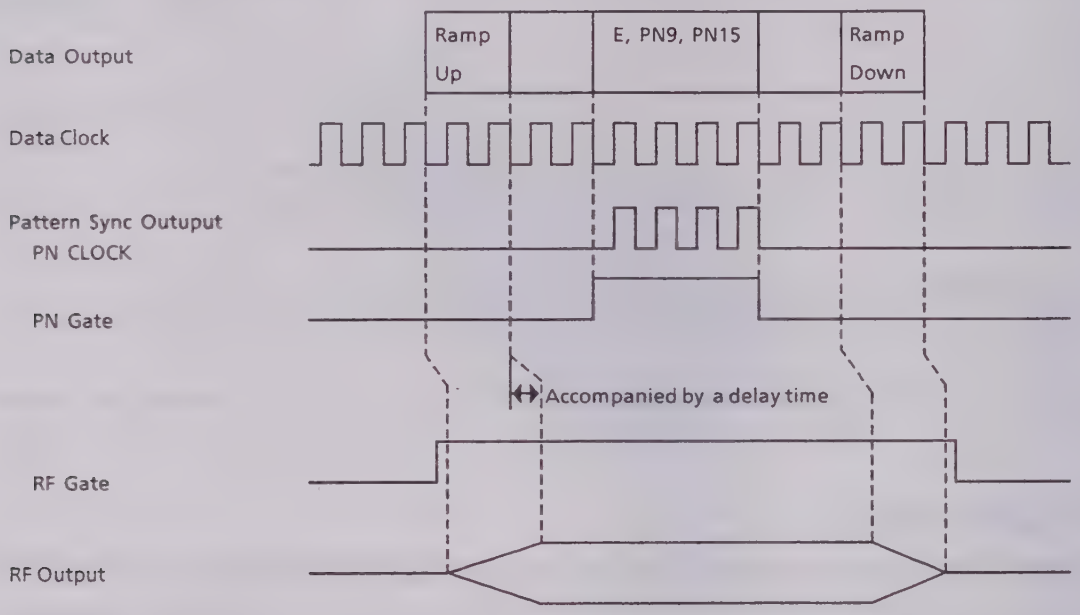


■ When the RF gate is selected

A control signal from the pulse modulation unit inside the main instrument is output.

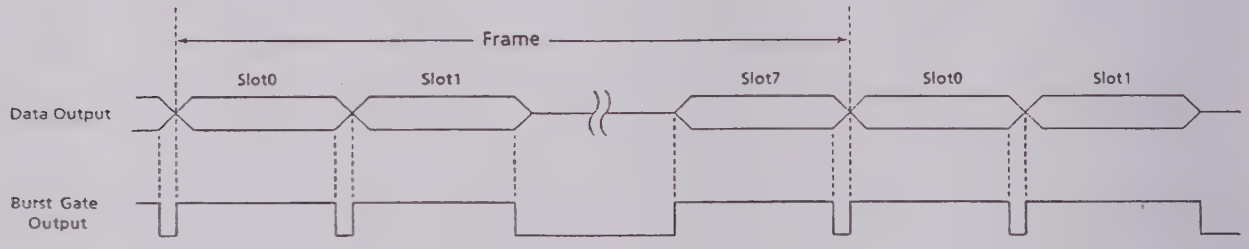


The details about the slot are shown in the figure below. The format of the slot in this figure is for explanation purposes only and differs from the actual system.

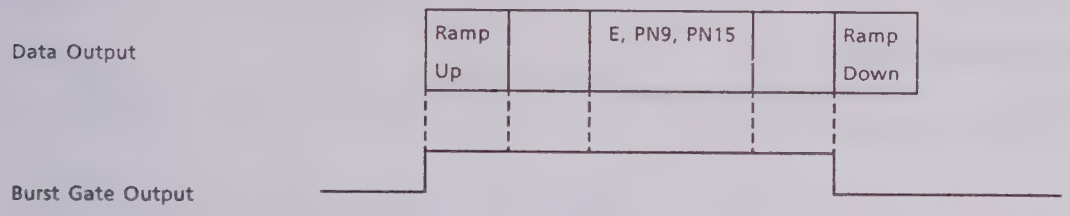


2.6.3 Burst gate signal

When the burst function is on and the internal pattern is used for modulation, a signal synchronized with the output slot in the frame is output..



The details about the slot are shown in the figure below. The format of the slot in this figure are for explanation purposes only and differs from the actual system.

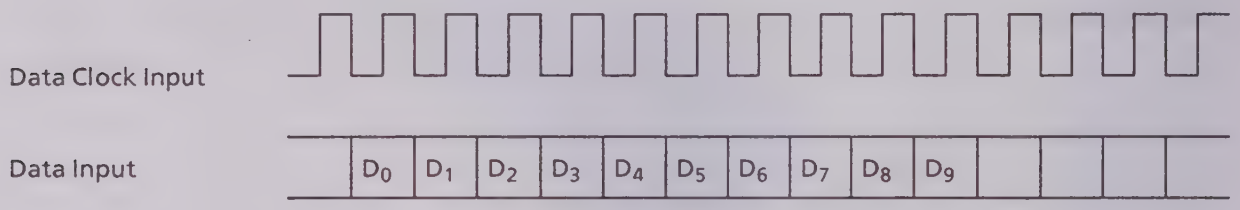


2.7 Auxiliary Inputs Signal

This paragraph explains the control signals input from the MG3670 series • MG3660A front panel.

2.7.1 Data, data clock signals

The input timings of the Data and Data Clock signals are shown below. In the figure, the polarities of the signals are expressed as positive or rising edge.



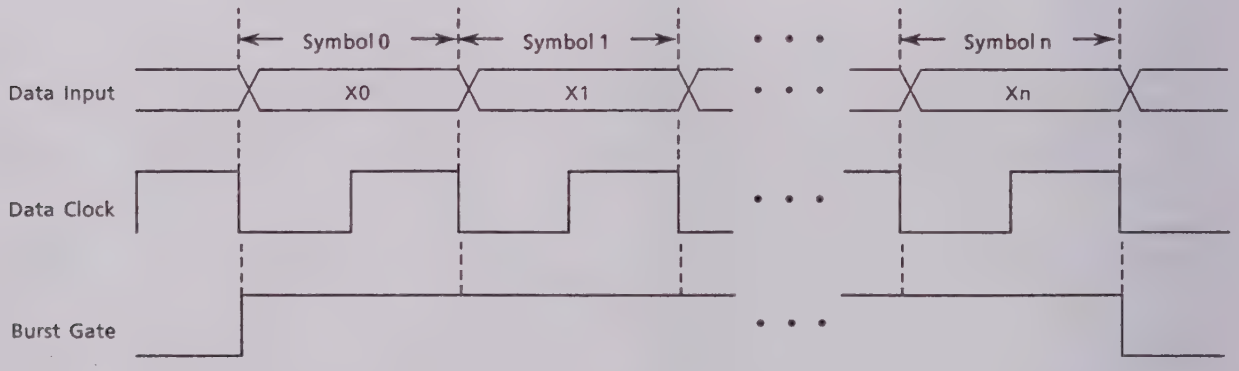
Note: • *For the GMSK modulation, one-bit data consists of one symbol, the symbol clock is not required.*

• *To input any one of the above signal , synchronize the timing to the output signal of the signal that will not be inputted.*

2.7.2 Burst gate signal

When the burst function is On and data input is set to Ext, the burst gate signal can be fed externally. This signal can be fed in synchronously with the data signal timing in order to generate an RF burst signal identical to the burst signal generated from the internal pattern. (This will smoothen the slope of the rising and falling edges and prevent the spectrum from deteriorating.)

Shown below are the input timings of the Data, Data Clock, and Burst Gate signals.



Where, n ≧ 13

Note: *The rising and falling edges of the power corresponds to Symbol 0, 1 and Symbol n+1, n+2, respectively.*

2.8 Differential Encoding Function (Differential Encode)

This function implements a differential encoding operation pursuant to GSM Rec. 05 and 04 when either a GSM or PCN communication system is selected. If this function is turned on, the differential encoding operation specified below is executed.

$$\hat{d}_i = d_i \oplus d_{i-1} \qquad (d_i \in \{0, 1\})$$

$\oplus$ denotes Exclusive-OR.

$$\alpha_i = 1 - 2\hat{d}_i \qquad (\alpha_i \in \{-1, +1\})$$

When α_i is $+1$, the phase will change in the positive direction (the frequency is shifted in the positive direction).

Notes:
- *If the phase change polarity (Phase Polarity) has been set to Inverse, the phase will change in the negative direction when α_i is $+1$.*
- *I and Q signal output is also subject to differential encoding.*
- *This function is inoperable when used with the MG0303A.*

2.9 Phase Change Polarity Selection Function (Phase Polarity)

This function selects the polarity of phase changes on modulation. If Phase Polarity is set to Inverse, the spectrum of the modulation signal will be inverted with respect to the center of the carrier wave.

With GSM/PCN systems

If the differential encoding function is turned on (Differential Encode: On)

Normal: The phase will change in the positive direction when α_i mentioned in Section 2.8 is $+1$.

Inverse: The phase will change in the negative direction when α_i mentioned in Section 2.8 is $+1$.

If the differential encoding function is turned off (Differential Encode: Off)

Normal: The phase will change in the positive direction when the modulation data is '1'.

Inverse: The phase will change in the negative direction when the modulation data is '1'.

With CT2 systems

Normal: The phase will change in the positive direction when the modulation data is '1'.

Inverse: The phase will change in the negative direction when the modulation data is '1'.

Notes:
- *Both I and Q signal outputs are governed by the phase change polarity setting.*
- *This function is inoperable when used with the MG0303A.*

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SECTION 3
DETAILED OPERATIONS

This section describes the operation, generated patterns and the trigger function of the MG0302A GMSK Modulation Unit and the MG0303B Burst Function Unit for each system.

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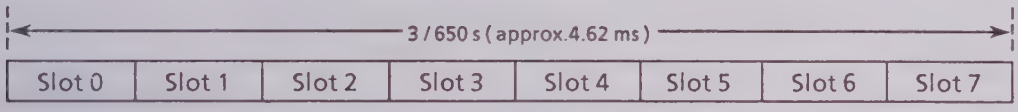
SECTION 3
DETAILED OPERATIONS

3.1 Operating the GSM/PCN system

3.1.1 Frame composition

The frame consists of eight slots. Signals are generated with one frame as one cycle. The PN9/PN15 pseudorandom pattern in PN and E sections is independent for each slot, and has continuity.



3.1.2 Slot composition

There are two types of slot for this system, namely, device evaluation slot, and normal burst slot.

(1) Device evaluation slot (DEVICE)

PN	G
148	8.25

G: Guard time ..... FF_H (8 bits)
PN: Pseudorandom pattern ..... PN9 pseudorandom pattern (PN pattern is continuous)

[Setting parameter]
- PN: PN9 or PN15 pseudorandom pattern

(2) Normal burst (NORMAL)

T	E	TS	E	T	G
3	58	26	58	3	8.25

T: Tail bits ..... 0_H (3 bits)
E: Encryption bits ..... Independent PN9 pseudorandom pattern for each slot (The PN pattern in E of the same slot has continuity.)
TS: Training Sequence bits ..... 0970897_H (26 bits)
G: Guard time ..... FF_H (8 bits)

[Setting parameter]
- TS: 0000000 to 3FFFFFF (26 bits)
- E: PN9 or PN15 pseudorandom pattern

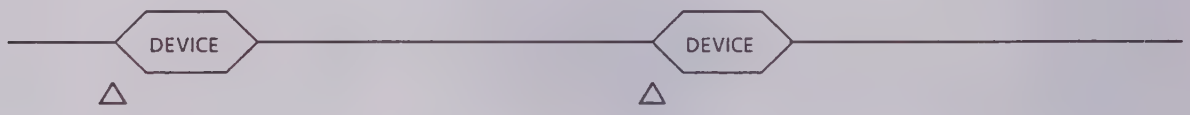
3.1.3 Standard internal modulation data

There are three types of standard internal modulation data in the GSM/PCN systems. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting mode).

Notes: • *'△' indicates the position of the burst trigger.*
• *All the slots (0 to 7) cannot be set to Off, simultaneously.*

(1) DEVICE

RF output applying device evaluation slots to slot 0

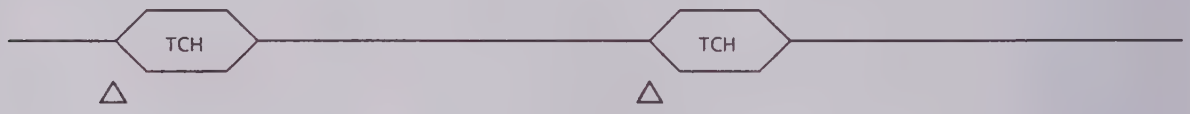


【 Setting parameter 】

• Slot: Slots 0 to 7 can be set to either DEVICE or OFF.

(2) TCH

RF output applying normal burst slot to slot 0

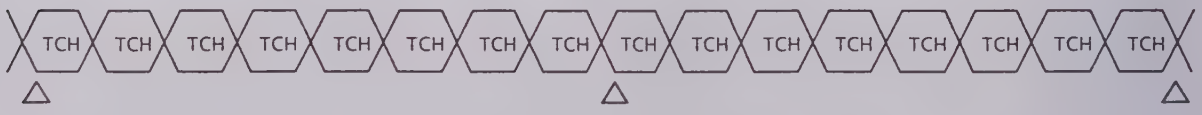


【 Setting parameter 】

• Slot: Slots 0 to 7 can be set to normal burst TCH or OFF.

(3) TCH ALL

RF output applying normal burst slot to all the slots 0 to 7



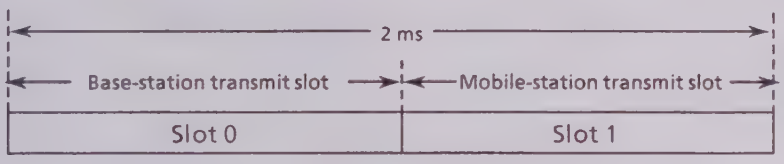
【 Setting parameter 】

• Slot: Slots 0 to 7 can be set to normal burst TCH or OFF.

3.2 Operating the CT2 System

3.2.1 Frame composition

The TDMA frame of the CT2 system consists of two slots. Signals are generated with one frame considered as one cycle. The PN9/PN15 pseudorandom pattern in the D and B sections of each slot has continuity.



3.2.2 Slot composition

There are three types of slots for this system, namely, Multiplex-1.2 slot, Multiplex-1.4 slot and Multiplex-2 slot.

(1) Multiplex 1.4

R	D	B	D	R
2	2	64	2	2

R: Ramp bits ..... 2_H (2 bits)
D: Data bits ..... 2_H (2 bits)
B: ..... PN9 pseudorandom pattern (No scramble, PN pattern has continuity.)
Scramble function: ..... Off
[Setting parameter]
- B: N9/PN15 pseudorandom pattern or FFFFFFFF(64 bits)
- D: PN9/PN15 pseudorandom pattern or 2_H (2 bits)
- Scramble function: On/Off

(2) Multiplex 1.2

Ga	R	Da	B	Db	R	Gb
1	2	1	64	1	2	1

Ga, Gb: Guard bits ..... Ga: 0_H (1 bit), Gb: 1_H (1 bit)
R: Ramp bits ..... 2_H (2 bits)
Da, Db: Data bits ..... Da: 1_H (1 bit), Db: 0_H (1 bit)
B: ..... PN9 pseudorandom pattern (No scramble, PN pattern has continuity.)
Scramble function: ..... Off
[Setting parameter]
- B: N9/PN15 pseudorandom pattern or FFFFFFFF(64 bits)
- Da, Db: 0_H (1 bit) or 1_H (1 bit)
- Scramble function: On/Off

(3) Multiplex 2

Ga	R	D	P	CHM / SYNC	D	R	Gb
1	2	16	10	24	16	2	1

Ga, Gb: Guard bits ..... Ga: 0_H (1 bit), Gb: 1_H (1 bit)
R: Ramp bits ..... 2_H (2 bits)
D: Data bits ..... PN9 pseudorandom pattern (No scramble, PN pattern has continuity.)
P: Preamble ..... $2AA_H$ (10 bits)
Scramble function(D): ..... Off
[Setting parameter]

- D: N9/PN15 pseudorandom pattern
- CHM/SYNC: Base-station transmit slot CHMF: $0A727D_H$ (24 bits)
  SYNCF: $A0D8D7_H$ (24 bits)
  Mobile-station transmit slot CHMP: $F58D82_H$ (24 bits)
  SYNCP: $5F2728_H$ (24 bits)
- Scramble function: On/Off

3.2.3 Standard internal modulation data

There are six types of standard internal modulation data available in the CT2 system. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting mode).

Notes: • *'△' indicates the position of the burst trigger.*
• *All the slots (1 to 2) cannot be set to Off, simultaneously.*

(1) DOWN MULTIPLEX 1.4 (DN MULTI 1.4)

RF output applying Multiplex 1.4 to slot 0

【 Setting parameter 】

None

(2) DOWN MULTIPLEX 1.2 (DN MULTI 1.2)

RF output applying Multiplex 1.2 to slot 0

【 Setting parameter 】

None

(3) DOWN MULTIPLEX 2 (DN MULTI 2)

RF output applying Multiplex-2 CHMF to slot 0

【 Setting parameter 】

None

(4) UP MULTIPLEX 1.4 (UP MULTI 1.4)

RF output applying Multiplex 1.4 to slot 1

【 Setting parameter 】

None

(5) UP MULTIPLEX 1.2 (UP MULTI 1.2)

RF output applying Multiplex 1.2 to slot 1

【 Setting parameter 】

None

(6) UP MULTIPLEX 2 (UP MULTI 2)

RF output applying Multiplex-2 CHMP to slot 1

【 Setting parameter 】

None

3.3 Detailed Trigger Function

There are two trigger functions for generating burst signals at internal modulation mode. These are:

① Internal trigger that works synchronously with the internal trigger signal
② External trigger that works synchronously with the external trigger signal.

3.3.1 Operation of the internal trigger

An internal trigger works by generating a burst signal synchronous with the internal trigger signal. This trigger signal is output from the Burst Trig Output connector on the rear panel. Since the trigger signal is produced at every cycle of the burst signal, its period can be fixed in every system.

3.3.2 Operation of the external trigger

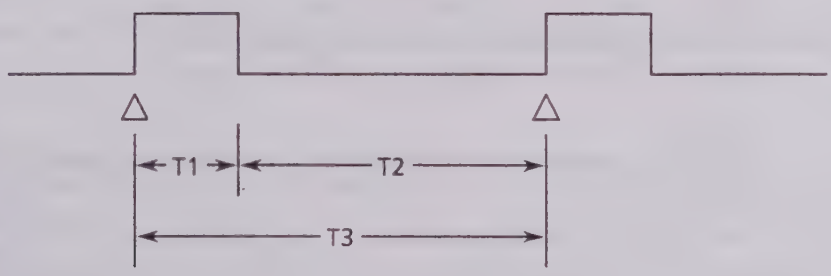
An external trigger works by generating a burst signal synchronous with the external fed trigger signal. This trigger signal is fed to the Burst Trig Input connector on the rear panel.

(1) External trigger signal input conditions

(a) Input level: TTL level

(b) Polarity : Either rising or falling edge can be selected

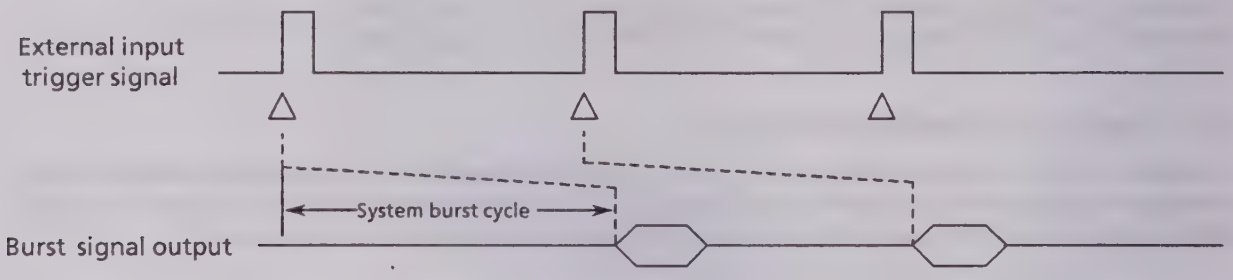
(c) Waveform : The waveform below illustrates a rising edge trigger waveform



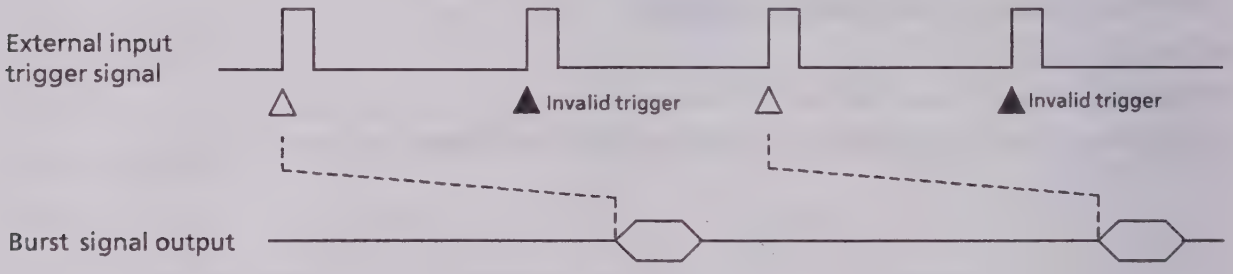
T1 : ≧0.1 μs
T2 : ≧0.1 μs
T3 : burst cycle (frame cycle) ± 1 symbol
rise/fall time: ≦100 ns

(2) Relationship between external input trigger signal and output burst signal

The figure below illustrates that the external input trigger signal is produced after a delay of one burst cycle.



Note: *If the period of the external input trigger signal does not satisfy the input condition in (1), the trigger signal is masked and invalidated as illustrated in the figure below. Therefore, the burst signal synchronized with the trigger signal cannot be obtained.*

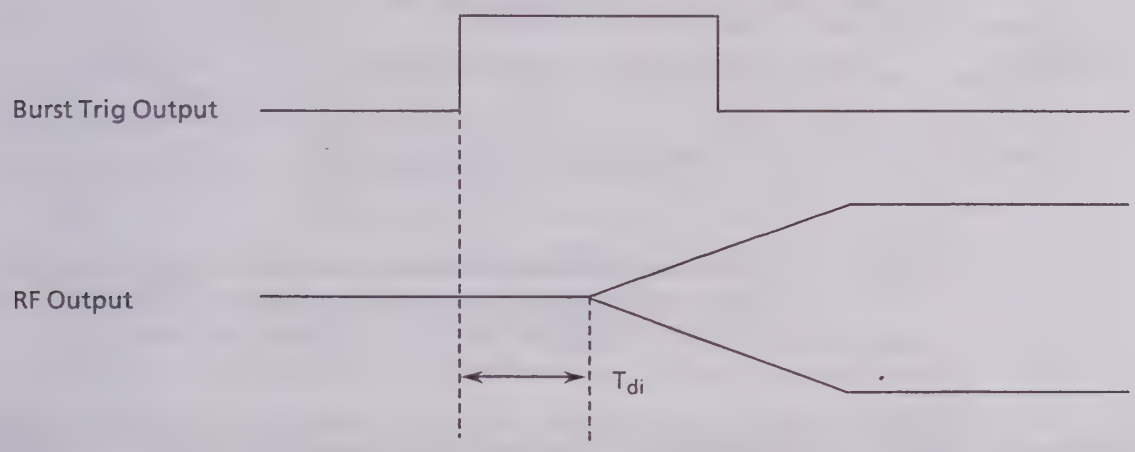


3.3.3 Output Timing of Burst Trigger and RF Signals

Pay attention to output timings of trigger and RF signals when synchronized with another equipment using the burst trigger signal of the MG3670 series • MG3660A. Relationships between trigger and RF signals are explained below.

(1) When internal trigger signal is used

The output timing of RF signal is shown below when synchronized with another equipment using the Burst TrigOutput signal from the MG3670 series • MG3660A rear panel.



T_{di}: Represents the delay time when burst wave is output using the internal trigger signal, which corresponds to the time from trigger until the start up of the first slot in the frame.

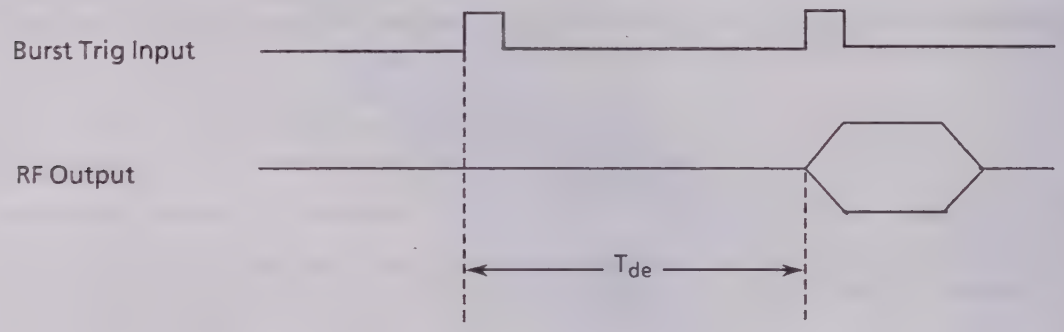
Relationships between communication system and Tdf

Communication system	Delay time T_{di}	( ) indicates symbol converted value.
GSM/PCN	0.26 ± 0.10 μs	(0.070 ± 0.027 symbol)
CT2	Multiplex 1.4	14.6 ± 0.2 μs (1.051 ± 0.014 symbol)
	Multiplex 1.2 Multiplex 2	28.5 ± 0.2 μs (2.051 ± 0.014 symbol)

CAUTION: *T_{di} includes error from system to system and is unique to each system, excluding the jitter.*

(2) When external trigger signal is used

The output timing of RF signal is shown below when synchronized with another equipment using the Burst TrigIntput signal to the MG3670 series • MG3660A rear panel. The RF signal is output with a delay equivalent to approximately 1 frame period (T_{de}) of the communication system from the trigger signal. This matches the timing of the second trigger signal to that of the RF output when a trigger signal meeting the communication system is input.



T_{de}: Represents the delay time when burst wave is output using the external trigger signal, which corresponds to the time from trigger until the start up of the first slot in the frame.

When an external trigger signal is used, the Tde value varies according to the mean used for synchronizing the MG3670 series • MG3660A with the trigger signal source equipment. The following explains T_{de} values by synchronization methods.

(A) When connecting only with trigger signal

The delay time is calculated using the formula below when only the trigger signal is input to the MG3670 series • MG3660A:

T_{de1} = Frame period of communication system + T_{di} ± Synchronization error (1/16 symbol)

T_{de1}: Delay time for connection only by trigger signal
T_{di}: Delay time for operation with internal trigger signal
Synchronization error: Jitter occurs within ±1/16 symbol since the MG3670 series • MG3660A is not synchronized with the external trigger signal source.

CAUTION: When the MG3670 series • MG3660A is synchronized with the external trigger signal source using the 10/13 MHz reference signal, no jitter occurs. The jitter value is inconsistent within a range ±1/16 symbol the synchronization error.

Relationships between communication system and T_{de1}

Communication system	Delay time T_{de1} ( ) indicates symbol converted value.	
	3/650s + 0.26 ± 0.33 μs {1 frame + (0.070 ± 0.089 symbol)}	
CT2	Multiplex 1.4	2ms + (14.6 ± 1.07) μs {1 frame + (1.051 ± 0.077 symbol)}
	Multiplex 1.2 Multiplex 2	2ms + (28.5 ± 1.07) μs {1 frame + (2.051 ± 0.077 symbol)}

(B) When Data Clock and Symbol Clock are connected

Delay times are calculated using the formula below when trigger signal is input to the MG3670 series • MG3660A with Data Clock connected:

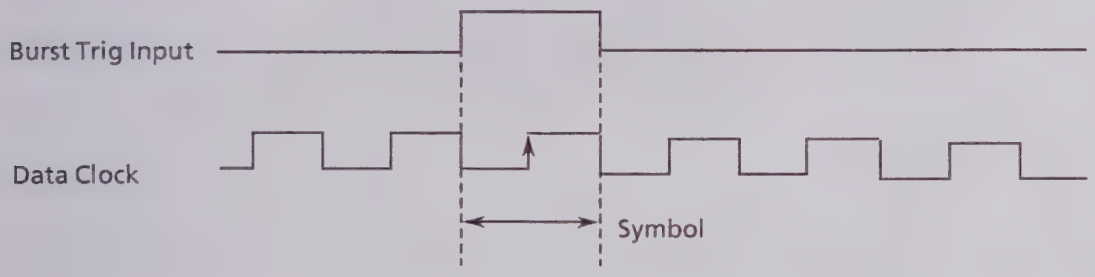
T_{de2} = (Frame period of communication system) + T_{di}

T_{de2}: Delay time when trigger signal, Data Clock are connected
T_{di}: Delay time when operated using the internal trigger signal

Relationships between communication system and T_{de2}

Communication system	Delay time T_{de2} ( ) indicates symbol converted value.	
	3/650s + (0.26 ± 0.10) μs {1 frame + (0.070 ± 0.027 symbol)}	
CT2	Multiplex 1.4	2ms + (14.6 ± 0.2) μs {1 frame + (1.051 ± 0.014 symbol)}
	Multiplex 1.2 Multiplex 2	2ms + (28.5 ± 1.07) μs {1 frame + (2.051 ± 0.014 symbol)}

The figure below shows timings of Data Clock, and trigger signals. (When polarities of all signals are positive)



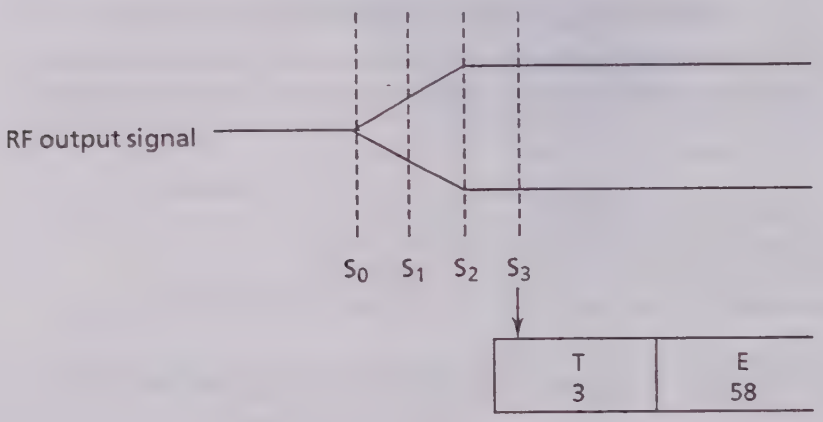
CAUTION: *When Data Clock is used for synchronization, the trigger signal input timing is adjusted in 1 symbol steps since the Symbol Clock monitors the Burst Trig Input signal.*

3.3.4 Relationships Between RF Signal and Symbol Judgment Point

Relationships between the RF output signal and symbol judgment point vary according to the communication system. The relationships are, therefore, explained for each system. Here, the symbol judgment point is defined as the point where the impulse response of the base band filter is the maximum.

(1) GSM/PCN system

Relationships between modulation data against the RF signal and the symbol judgment point is explained using slot 0 of the traffic channel as an example.



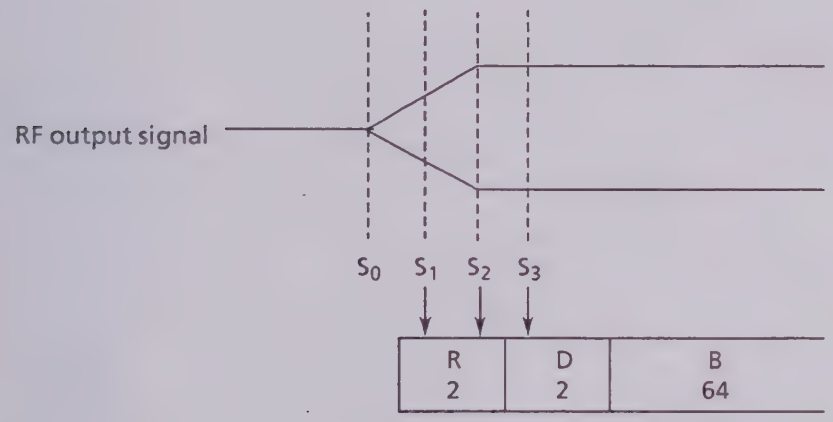
S_3: First symbol generated by the tail bit
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to S0.
(For details on delay time, refer to Paragraph 3.3.3.)

(2) CT2 system

For the CT2 system, the timing varies according to the type of slot used. The timing relationships are, therefore, explained for each slot type.

■ When Multiplex1.4 is used

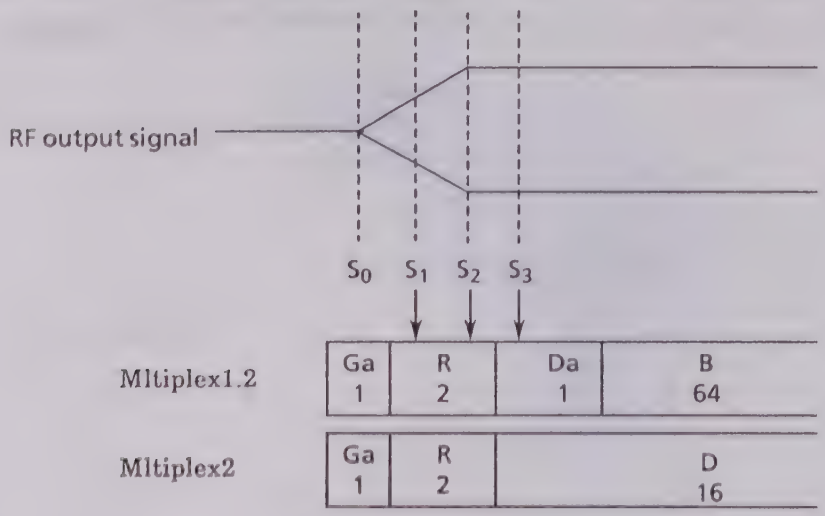
Relationships between modulation data against the RF signal and the symbol judgment point is explained when, as an example, Multiplex 1.4 is installed to slot 0 of the downlink traffic channel.



S_1: First symbol generated by the burst transient response ramp bit
S_2: Second symbol generated by the burst transient response ramp bit
S_3: First symbol generated by the data bit
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to S_0.
(For details on delay time, refer to Paragraph 3.3.3.)

■ When Multiplex1.2 or Multiplex2 is used

Relationships between modulation data against the RF signal and the symbol judgment point is explained when, as an example, Multiplex 1.2 or Multiplex2 is installed to slot 0 of the downlink traffic channel.



S_1: First symbol generated by the burst transient response ramp bit
S_2: Second symbol generated by the burst transient response ramp bit
S_3: First symbol generated by the data bit
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to S_0.
(For details on delay time, refer to Paragraph 3.3.3.)

SECTION 4
MEASUREMENT

This section describes how to perform code error rate measurement for receivers, demodulator evaluation measurement, and modulator evaluation measurement using the MG0302A GMSK Modulation Unit and the MG0303B Burst Function Unit in combination with the MG3670 series • MG3660A Digital Modulation Signal Generator.

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4.3 Modulator Evaluation Measurement 4-6

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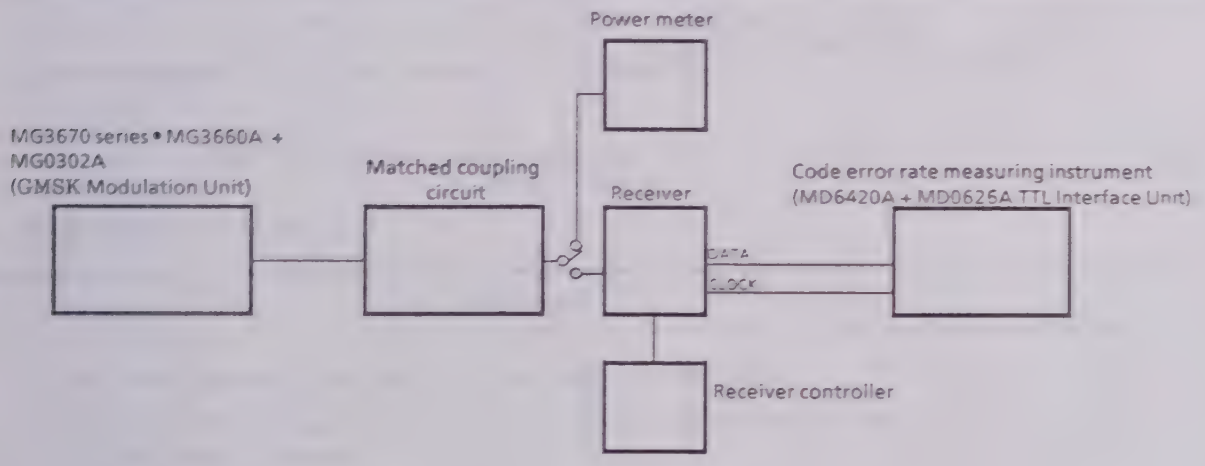
SECTION 4
MEASUREMENT

4.1 Code Error Rate Measurement for Receiver

The procedure for measuring a receiver code error rate using the MG3670 series • MG3660A + MG0302A system is described below. It is assumed that the receiver is equipped with a control mode that enables it to receive continuous waves.

(1) Setup



(2) Measurement procedure

Step	Procedure
1	Set the MG3670 series • MG3660A to the frequency to be tested.
2	Set the MG3670 series • MG3660A output to a level suitable for the receiver and the Matched coupling circuit.
3	Set the MG3670 series • MG3660A to the modulation system of the receiver.
4	Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern.
5	Connect the MG3670 series • MG3660A RF output to the power meter through the Matched coupling circuit. Using the power meter, adjust the MG3670 series • MG3660A output to the sensitivity test level.
6	Switch the Matched coupling circuit output to the receiver.
7	Using the receiver controller, set the receiver to the continuous wave reception mode.
8	Connect the receiver demodulation data output and data clock to the code error rate measuring instrument.

The procedure when the code error rate measuring instrument used is Anritsu MD6420A Data Transmission Analyzer is described below.

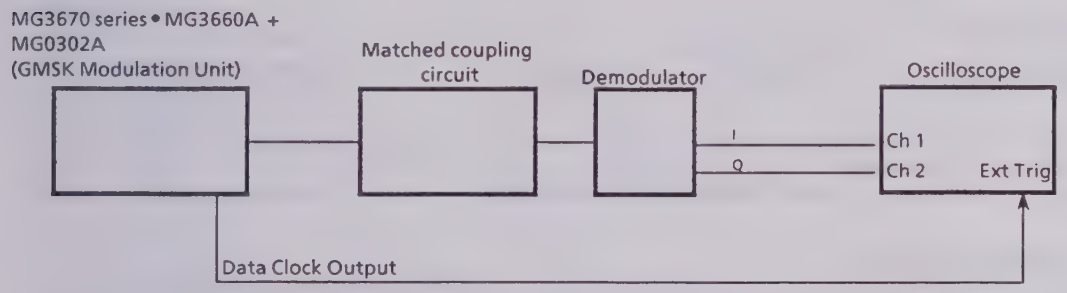
Step	Procedure
9	Connect the data and clock obtained from the receiver to the RD (Data) and RT (Clock) connectors of the TTL Interface Unit (MD0626A) on the rear panel of the MD6420A.
10	Set the MD6420A receive timing as follows: • If data is sampled at the rising edge of the clock, set to RT (INV) mode. • If data is sampled at the falling edge of the clock, set to RT mode.
11	Set the MD6420A pattern to 2^9-1 (PN9).
12	Press the MD6420A MEAS key to measure the code error rate.

4.2 Demodulator Evaluation Measurement

The procedure for performing the evaluation measurement for a demodulator using the MG3670 series • MG3660A + MG0302A system is described below.

If the MG0303B Burst Function Unit is incorporated in the MG3670 series • MG3660A, it is also possible to perform evaluation using burst signals.

(1) Setup



(2) Measurement procedure

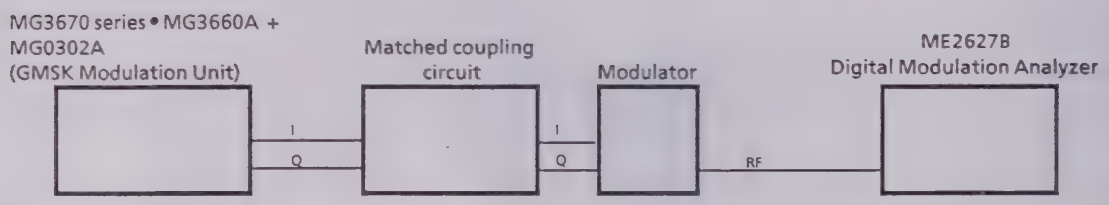
Step	Procedure
1	Set the MG3670 series • MG3660A to the frequency to be tested.
2	Set the MG3670 series • MG3660A output to a level suitable for the demodulator and the Matched coupling circuit.
3	Set the MG3670 series • MG3660A to the modulation system to be tested.
4	Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern. (If the MG0303B is incorporated, burst signal can also be set.)
5	Set the oscilloscope to external trigger mode, and adjust the Ch1 and Ch2 amplitude sensitivity to measure the I/Q signals. Set the oscilloscope to X-Y display mode to measure the signal locus.

4.3 Modulator Evaluation Measurement

The procedure for performing evaluation measurement for a modulator using the MG3670 series • MG3660A + MG0302A system is described below.

It is assumed that Anritsu ME2627B Digital Modulation Analyzer is used in evaluating the modulator's modulation signal output.

(1) Setup



(2) Measurement procedure

Step	Procedure
1	Set the MG3670 series • MG3660A output to a level suitable for the demodulator and the Matched coupling circuit.
2	Set the MG3670 series • MG3660A to the modulation system to be tested.
3	Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern.
4	Set the ME2627B so that the modulation system and pattern set in steps 2 and 3 can be received.
5	Using the ME2627B, measure the modulation accuracy and evaluate it. (For information on the ME2627B operation, refer to the ME2627B Operation Manual.)

SECTION 5
PERFORMANCE TESTS

This section describes the measuring instruments needed for performance tests, setup, and procedures using the MG0301C π/4 DQPSK Modulation Unit and the MG0303B Burst Function Unit in combination with the MG3670 series • MG3660A Digital Modulation Signal Generator. These performance tests are performed to check if the main performance parameters of the MG0301C and the MG0303B satisfy standard levels.

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SECTION 5
PERFORMANCE TESTS

5.1 Performance Tests Requirement

Performance tests are performed as preventive maintenance to prevent performance deterioration. Performance tests are required at acceptance inspection, periodic inspection, and post-repair performance verification.

The following are the items that should be tested for verifying the performance of the MG0302A:

- RF output modulation accuracy
- Modulation pattern

The following are the item that should be tested for verifying the performance of the MG0303B:

- Burst signal On/Off ratio

Execute performance tests periodically as preventive maintenance for important items. They should be executed at least once or twice a year to check performance. Contact the ANRITSU service department if the MG0302A or MG0303B fails to meet the specifications during performance tests.

5.2 Instruments Required for Performance Tests

The table below lists the measuring instruments required for the performance tests.

Recommended instrument (Anritsu model)	Required performance†1	Test items
Digital Modulation Analyzer (ME2627B)	10 MHz to 2.25 GHz†2	• RF output modulation accuracy
Data Transmission Analyzer (MD6420A)†3	72 to 270.83 kbps	• Modulation pattern
Spectrum Analyzer (MS2602A)	300 kHz to 2.25 GHz†2	• Burst signal On/Off ratio

†1 Only part of the performance that covers the test item measurement range is extracted.

†2 The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.

†3 Error rate measuring instrument

5.3 Performance Tests

Before executing the performance tests explained on the following pages, unless otherwise specified, the instrument under test and all the other measuring instruments must be warmed-up for at least 30 minutes so the test is executed under stable conditions. To measure at the highest accuracy, the tests must be performed at room temperature, and ac power-supply voltage fluctuations must be minimized, and vibration and humidity must be kept at a reasonable level.

5.3.1 RF output modulation accuracy

Verify the modulation accuracy of the RF modulated-signal output.

(1) Test specifications

- Modulation accuracy ..... 300 kHz to 2.25 GHz† (CT2)
  1 MHz to 2.25 GHz† (GSM/PCN)
- Modulation accuracy ..... ≦2° rms, ≦5° peak, at ≦ +5 dBm output level
  ≦1° rms, ≦3° peak, at ≦ +5 dBm output level, 25°C ±5°C, after 30 min. warm-up

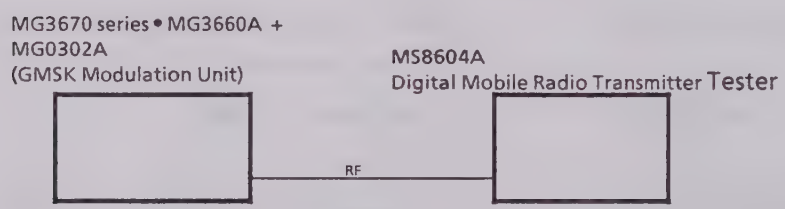
†: The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.

Note: *The signal in the 300kHz-to-10MHz frequency range cannot be measured with the ME2627B.*

(2) Test instrument

- Digital Modulation Analyzer ME2627B

(3) Setup



(5) Test procedure

Step	Procedure
1	Set the MG3670 series • MG3660A to the frequency to be tested.
2	Set the MG3670 series • MG3660A output level to +5 dBm.
3	Set the MG3670 series • MG3660A to the modulation system to be tested.
4	Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern.
5	Set the ME2627B so that the modulation system and pattern set in steps 3 and 4 can be received.

Step	Procedure
6	Using the ME2627B, measure the modulation accuracy of the RF modulated signal.
	When an MG0303B Burst Function Unit is installed, perform steps 7 to 10.
7	Set the MG3670 series • MG3660A burst function to On.
8	Set the modulation pattern to the communications channel.
9	Set the ME2627B so that the pattern set in step 8 can be received.
10	Using the ME2627B, measure the modulation accuracy of the RF modulated signal. (For information on the ME2627B operation, refer to the ME2627B Operation Manual.)

5.3.2 Modulation pattern

Verify the modulation pattern.

(1) Test specifications

- PN9 and PN15 pseudorandom pattern ..... Burst function Off
- PN9 and PN15 pseudorandom pattern on slot ..... Burst function Off

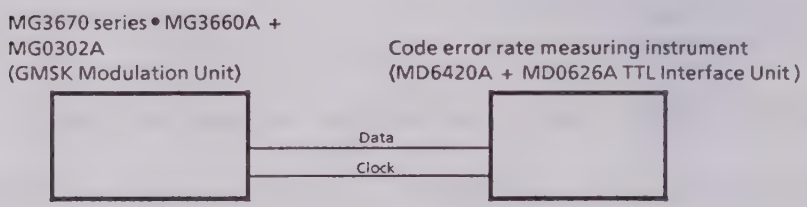
(2) Test instrument

- Data Transmission Analyzer MD6420A

MD6420A unit needed for measurement work:

MD0626A ..... TTL Interface Unit

(3) Setup



(4) Test procedure

Step	Procedure
1	Set the MG3670 series • MG3660A to the modulation system to be tested.
2	Set the MG3670 series • MG3660A modulation pattern to PN9/PN15 pseudorandom pattern.
3	Connect the MG3670 series • MG3660A data output and data clock to the code error rate measuring instrument. (Connect the data and the clock to the RD (Data) and RT (clock) connectors of the TTL Interface Unit (MD0626A) inserted on the MD6420A rear panel, respectively.)
4	Set the MD6420A receive timing to RT (INV) mode.
5	Set the MD6420A pattern to 2^9-1 (PN9) and $2^{15}-1$ (PN15).
6	Press the MD6420A MEAS key to measure the code error rate.
	When the MG0303B burst function unit is installed, perform steps 7 to 12.
7	Set the MG3670 series • MG3660A burst function to On.
8	Set the modulation pattern to the communications channel.
9	Set the Traffic channel to PN9/PN15 pseudorandom pattern.

Step	Procedure
10	Set the Pattern Sync output signal to PN Clock.
11	Set the MD6420A pattern to 2^9-1 (PN9) and $2^{15}-1$ (PN15).
12	Press the MD6420A MEAS key to measure the code error rate.
	Note: • *Set the polarity of the MG3670 series • MG3660A data output to positive.* • *For information on the MD6420A operation, refer to the MD6420A Operation Manual.*

5.3.3 Burst signal On/Off ratio

Verify the On/Off ratio of the burst signal output.

(1) Test specifications

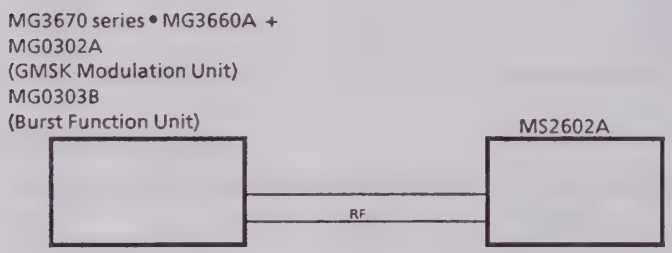
- Frequency range ..... 300 kHz to 2.25 GHz† (CT2)
  1 MHz to 2.25 GHz† (GSM, PCN)
- On/Off ratio ..... ≧ 80 dB: At 5 dBm output, installed in the MG3670B/3671A (CT2)
  ≧75 dB: At 5 dBm output, installed in the MG3660A (CT2)
  ≧75 dB: At 5 dBm output (GSM, PCN)

†: The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.

(2) Test instrument

- Spectrum analyzer MS2602A

(3) Setup



(4) Test procedure

Step	Procedure
1	Set the MG3670 series • MG3660A to the frequency to be tested.
2	Set the MG3670 series • MG3660A output level to +5 dBm.
3	Set the MG3670 series • MG3660A to the modulation system to be tested.
4	Set the MG3670 series • MG3660A burst function to On.
5	Set the MS2602A to the frequency to be tested.
6	Set the MS2602A sweep frequency width to 0 Hz, and observe the output level on and off condition in the time domain.
7	Set the MS2602A parameters to suitable levels, and measure the On and Off ratio. *(For information on the MS2602A operation, refer to the MS2602A Operation Manual.)*

SECTION 6
STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking and transportation of the MG0302A GMSK Modulation Unit and MG0303B Burst Function Unit.

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SECTION 6
STORAGE AND TRANSPORTATION

6.1 Storage Precautions

This paragraph describes the precautions to take for long-term storage of the MG0301C and MG0303B.

6.1.1 Precautions before storage

Avoid storing the MG0301C and MG0303B where:

1) It may be exposed to direct sunlight or high dust levels.
2) It may be exposed to high humidity.
3) It may be exposed to active gases.
4) It may be exposed to extreme temperatures ($< -40°C$ or $> 70°C$) or high humidity ($\geqq 90\%$).

6.1.2 Recommended storage precautions

The recommended storage conditions are as follows:

- Temperature ..... 0 to 30°C
- Humidity ..... 40% to 80%
- Stable temperature and humidity over 24-hour period

6.2 Repacking and Transportation

The following precautions should be taken if the MG0301C/MG0303B must be returned to Anritsu Corporation for servicing.

6.2.1 Repacking

Use the original packing materials. If the MG0301C/MG0303B is packed in other materials, observe the following packing procedure:

(1) Wrap the MG0301C/MG0303B in a plastic sheet or similar material.

(2) Use a cardboard, wooden box, or aluminum case which allows shock-absorbent material to be inserted on all sides of the equipment.

(3) Use enough shock-absorbent material to protect the MG0301C/MG0303B from shock during transportation and to prevent it from moving in the container.

(4) Secure the container with packing straps, adhesive tape or bands.

6.2.2 Transportation

Do not subject the MG0301C/MG0303B to severe vibration during transport. It should be transported under the storage conditions recommended.

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MG0302A

GMSK
Modulation Unit

Operation Manual
(GPIB Remote Control)

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1. GENERAL

The MG0302A GMSK Modulation Unit is one of the units used with the MG3670 series • MG3660A Digital Modulation Signal Generator.

This GPIB remote control part provides the MG0302A device message list, its detailed descriptions , and some sample programs with those commands specific to the MG0302A.

For other description of GPIB, refer to the GPIB Remote Control part in the MG3670 series • MG3660A Digital Modulation Signal Generator Operation Manual.

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2. MG0302A DEVICE MESSAGE LIST

The tables on the following pages list the command messages, query messages, and response messages specific to the MG0302A GMSK Modulation Unit.

2.1 How to Read the MG0302A Device Message List

(1) Command Messages (Command Msg)/Query Message (Query Msg)

(a)	Upper-case:	Reserved word
(b)	Number:	Reserved word (Number code)
(c)	Lower-case argument	
	n (Integral number):	Numeric data (NR1 format)
	h (hexadecimal number):	Numeric data (hexadecimal data)
	s:	Character string enclosed by double quotation marks (" ") or single quotation marks (' ')

(2) Response message (Response Msg)

(a)	Upper-case:	Reserved word
(b)	Number:	Reserved word (Number code)
(c)	Lower-case argument	
	n (Integral number):	Numeric data (NR1 format)
	h (hexadecimal number):	Numeric data (hexadecimal data)

Note: • *If the header is set to Off, then the response message header and the numeric data suffix code are not transferred. (Initial setting: Header Off)*

- ␣ *means a space of one character.*
- Ø *indicates a zero.*

2.2 MG0302A Device Message List

(1) Modulation

Measurement paramete		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets I,Q signal source	Modulation Mode Source			
	I, Q Int	MODE␣INT	MODE?	MODE␣INT
	I, Q Ext	MODE␣EXT	MODE?	MODE␣EXT
Differential encoding function (GSM, PCN system)	Differential Encode			
	On	DE␣ON	DE?	DE␣ON
	Off	DE␣OFF	DE?	DE␣OFF
Phase change polarity selection function	Phase Polarity			
	Normal	PP␣NORM	PP?	PP␣NORM
	Inverse	PP␣INVS	PP?	PP␣INVS
Sets internal modulation data (BURST OFF)	Pattern			
	0000	PAT␣0000	PAT?	PAT␣0000
	0001	PAT␣0001	PAT?	PAT␣0001
	0010	PAT␣0010	PAT?	PAT␣0010
	0011	PAT␣0011	PAT?	PAT␣0011
	0100	PAT␣0100	PAT?	PAT␣0100
	0101	PAT␣0101	PAT?	PAT␣0101
	0110	PAT␣0110	PAT?	PAT␣0110
	0111	PAT␣0111	PAT?	PAT␣0111
	1000	PAT␣1000	PAT?	PAT␣1000
	1001	PAT␣1001	PAT?	PAT␣1001
	1010	PAT␣1010	PAT?	PAT␣1010
	1011	PAT␣1011	PAT?	PAT␣1011
	1100	PAT␣1100	PAT?	PAT␣1100
	1101	PAT␣1101	PAT?	PAT␣1101
	1110	PAT␣1110	PAT?	PAT␣1110
	1111	PAT␣1111	PAT?	PAT␣1111
	PN15	PAT␣PN15	PAT?	PAT␣PN15
	PN9	PAT␣PN9	PAT?	PAT␣PN9
Turns Burst function on or off	Burst			
	On	BST␣ON	BST?	BST␣ON
	Off	BST␣OFF	BST?	BST␣OFF
Sets burst trigger source	Burst Trigger			
	Int	BTG␣INT	BTG?	BTG␣INT
	Ext	BTG␣EXT	BTG?	BTG␣EXT

(2) Internal modulation data

Measurement paramete		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Selects communication systems	System			
	GSM	SYS␣GSM	SYS?	SYS␣GSM
	PCN	SYS␣PCN	SYS?	SYS␣PCN
	CT2	SYS␣CT2	SYS?	SYS␣CT2
Sets internal modulation data (BURST ON)	Pattern			
	GSM, PCN			
	DEVICE	PAT␣DEV	PAT?	PAT␣DEV
	TCH	PAT␣TCH	PAT?	PAT␣TCH
	TCH ALL	PAT␣TCA	PAT?	PAT␣TCA
	CT2			
	DOWN MULTIPLEX 1.4	PAT␣DN1.4	PAT?	PAT␣DN1.4
	DOWN MULTIPLEX 1.2	PAT␣DN1.2	PAT?	PAT␣DN1.2
	DOWN MULTIPLEX 2	PAT␣DN2	PAT?	PAT␣DN2
	UP MULTIPLEX 1.4	PAT␣UP1.4	PAT?	PAT␣UP1.4
	UP MULTIPLEX 1.2	PAT␣UP1.2	PAT?	PAT␣UP1.2
	UP MULTIPLEX 2	PAT␣UP2	PAT?	PAT␣UP2
	Memory	PAT␣MEMn	PAT?	PAT␣MEMn

(3) Setting the slot

Measurement paramete		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Selects slot number	Select Slot Number	SLOTNO␣n	SLOTNO?	SLOTNO␣n
Sets the slot	Modify Slot			
	GSM, PCN			
	DEVICE:			
	On	SLOT␣ON	SLOT?	SLOT␣ON
	Off	SLOT␣OFF	SLOT?	SLOT␣OFF
	TCH:			
	On	SLOT␣ON	SLOT?	SLOT␣ON
	Off	SLOT␣OFF	SLOT?	SLOT␣OFF
	TCH ALL:			
	On	SLOT␣ON	SLOT?	SLOT␣ON
	Off	SLOT␣OFF	SLOT?	SLOT␣OFF

(4) Setting data of the pattern

Measurement paramete		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Sets data of the pattern	Pattern Edit			
	GSM, PCN			
	DEVICE:PN			
	PN9	PN␣PN9	PN?	PN␣PN9
	PN15	PN␣PN15	PN?	PN␣PN15
	NORMAL:TS	TS␣h	TS?	TS␣h
	NORMAL:E			
	PN9	E␣PN9	E?	E␣PN9
	PN15	E␣PN15	E?	E␣PN15
	CT2			
	Multiplex 1.4:B			
	PN9	B␣PN9	B?	B␣PN9
	PN15	B␣PN15	B?	B␣PN15
	ALL '1' (FFFFFFFF)	B␣ALL1	B?	B␣ALL1
	Multiplex 1.4:Scramble			
	On	SCBL␣ON	SCBL?	SCBL␣ON
	Off	SCBL␣OFF	SCBL?	SCBL␣OFF
	Multiplex 1.4:D			
	PN9	D␣PN9	D?	D␣PN9
	PN15	D␣PN15	D?	D␣PN15
	10	D␣1Ø	D?	D␣1Ø
	Multiplex 1.2:B			
	PN9	B␣PN9	B?	B␣PN9
	PN15	B␣PN15	B?	B␣PN15
	ALL '1' (FFFFFFFF)	B␣ALL1	B?	B␣ALL1
	Multiplex 1.2:Scramble			
	On	SCBL␣ON	SCBL?	SCBL␣ON
	Off	SCBL␣OFF	SCBL?	SCBL␣OFF
	Multiplex 1.2:Da			
	0	DA␣Ø	DA?	DA␣Ø
	1	DA␣1	DA?	DA␣1
	Multiplex 1.2:Db			
	0	DB␣Ø	DB?	DB␣Ø
	1	DB␣1	DB?	DB␣1
	Multiplex 2:D			
	PN9	D␣PN9	D?	D␣PN9
	PN15	D␣PN15	D?	D␣PN15
	Multiplex 2:CHM/SYNC			
	CHM	CHSY␣CHM	CHSY?	CHSY␣CHM
	SYNC	CHSY␣SYNC	CHSY?	CHSY␣SYNC

(5) Save

Measurement paramete		Command Msg	Query Msg	Response Msg
Brief Function	Control Item			
Saves burst internal modulation data	Burst Pattern Memory Save	BSAV␣n[,s]†	———	———

† It is possible to omit 's'(Title).

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3. DETAILED DESCRIPTION OF COMMANDS

This section describes in detail the device messages for MG0302A GMSK Modulation Unit. The device messages are listed in alphabetical.

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B

■ Function — Sets the B data of Multiplex 1.4/Multiplex 1.2 slot in the CT2 system. (When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
B	B␣a	B?	B␣a

■ Value of a — PN9, PN15, ALL1
■ Suffix code — None
■ Initial setting — PN9
■ Example — B␣PN15

BSAV Burst-Pattern-Memory Save

■ Function — Saves the burst internal modulation data to burst pattern memory. (When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
BSAV	BSAV␣a[,b]	———	———

■ Value of a — Ø to 99
■ Value of b — Character string whithin 8 characters enclosed by double quotation marks or single quotation marks.
Saves the title which is sets currently if b is omitted.
Saves the first eight characters of b if b is over eight characters.
■ Suffix code — None
■ Example — BSAV␣5, "MG367ØB"

BST Burst On / Off

■ Function

Turns the Burst function On or Off.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
BST	BST␣a	BST?	BST␣a

■ Value of a

ON: On
OFF: Off

■ Suffix code

None

■ Initial setting

OFF

■ Example

BST␣ON

BTG Burst-Trigger Source

■ Function

Sets the burst trigger source to either internal (Int) or external (Ext).
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
BTG	BTG␣a	BTG?	BTG␣a

■ Value of a

INT: Internal burst trigger
EXT: External burst trigger

■ Suffix code

None

■ Initial setting

INT

■ Example

BTG␣EXT

CHSY CHM / SYNC

■ Function

Sets the CHM/SYNC data of Multiplex 2 slot in the CT2 system.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
CHSY	CHSY␣a	CHSY?	CHSY␣a

■ Value of a CHM, SYNC

■ Suffix code None

■ Initial setting CHM

■ Example CHSY␣SYNC

D Data

■ Function

Sets the D data of Multiplex 1.4/Multiplex 2 slot in the CT2 system.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
D	D␣a	D?	D␣a

■ Value of a

When slot is Multiplex1.4: PN9, PN15, 1Ø (Binary)

When slot is Multiplex2: PN9, PN15

■ Suffix code

None

■ Initial setting

When slot is Multiplex1.4 1Ø

When slot is Multiplex2 PN9

■ Example

D␣PN15
D␣1Ø

DA Data (a)

■ Function

Sets the Da data of Multiplex 1.2 slot in the CT2 system.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
DA	DA␣a	DA?	DA␣a

■ Value of a Ø, 1

■ Suffix code None

■ Initial setting 1

■ Example DA␣Ø

D

DB Data (b)

■ Function Sets the DB data of Multiplex 1.2 slot in the CT2 system.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
DB	DB␣a	DB?	DB␣a

■ Value of a Ø, 1
■ Suffix code None
■ Initial setting Ø
■ Example DB␣1

DE Differential Encode

■ Function Turns the differential encoding function of a GSM or PCN system on or off.

Header	Program command	Query	Response
DE	DE␣a	DE?	DE␣a

■ Value of a ON: On
OFF: Off
■ Suffix code None
■ Initial setting ON
■ Example DE␣OFF

E Encryption Bits

■ Function

Sets the E data of Normal slot in the GSM and PCN systems.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
E	E␣a	E?	E␣a

■ Value of a PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example E␣PN15

MODE Modulation-Mode Source

■ Function

Sets the I,Q signals source to either internal (Int) or external (Ext).

Header	Program command	Query	Response
MODE	MODE␣a	MODE?	MODE␣a

■ Value of a

INT: Internal I, Q signals
EXT: External I, Q signals

■ Suffix code

None

■ Initial setting

INT

■ Example

MODE␣EXT

PAT Pattern

■ Function

Sets the internal modulation data when the burst function turns on.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
PAT	PAT␣a	PAT?	PAT␣a

■ Value of a

When system is GSM, PCN

DEV:	DEVICE
TCH:	TCH
TCA:	TCH ALL

When system is CT2

DN1.4:	DOWN MULTIPLEX 1.4
DN1.2:	DOWN MULTIPLEX 1.2
DN2:	DOWN MULTIPLEX 2
UP1.4:	UP MULTIPLEX 1.4
UP1.2:	UP MULTIPLEX 1.2
UP2:	UP MULTIPLEX 2

■ Suffix code

None

■ Initial setting

When system is GSM, PCN DEV
When system is CT2 DN1.4

■ Example

PAT␣TCH

PAT Pattern

■ Function Sets the internal modulation data when the burst function turns off.

Header	Program command	Query	Response
PAT	PAT␣a	PAT?	PAT␣a

■ Value of a 0000 to 1111 (optional 4 bits), PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example PAT␣PN15

PAT Pattern in "Memory"

■ Function Chooses the burst internal modulation data from 100 patterns in the burst pattern memory.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
PAT	PAT␣MEMa	PAT?	PAT␣MEMa

■ Value of a 00 to 99

■ Suffix code None

■ Example PAT␣MEM3

PAT Pattern

■ Function Sets the internal modulation data pattern when the burst function turns off.

Header	Program command	Query	Response
PAT	PAT␣a	PAT?	PAT␣a

■ Value of a ØØØØ to 1111 (optional 4 bits), PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example PAT␣PN15

PAT Pattern in "Memory"

■ Function Chooses the burst internal modulation data from 100 patterns in the burst pattern memory.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
PAT	PAT␣MEMa	PAT?	PAT␣MEMa

■ Value of a ØØ to 99

■ Suffix code None

■ Example PAT␣MEM3

PN Pseudo random

■ Function

Sets the PN data of DEVICE slot.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
PN	PN␣a	PN?	PN␣a

■ Value of a PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example PN␣PN15

PSID PS Identification Code

■ Function

Sets the PS-ID data of SYNC slot in the PHP system.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
PSID	PSID␣a	PSID?	PSID␣a

■ Value of a #H0000000 to #HFFFFFFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #H0000001

■ Example PSID␣#H0000003

SLOTNO Slot Number

■ Function Selects the slot number in the pattern.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
SLOTNO	SLOTNO␣a	SLOTNO?	SLOTNO␣a

■ Value of a The slot number range depends on the system.

System	Range of slot number
GSM	Ø to 7
PCN	Ø to 7

■ Suffix code None

■ Initial setting Ø

■ Example SLOTNO␣1

SYS System

■ Function Selects the communication systems.

Header	Program command	Query	Response
SYS	SYS␣a	SYS?	SYS␣a

■ Value of a GSM, PCN, CT2

■ Suffix code None

■ Initial setting GSM

■ Example SYS␣CT2

TS Training Sequence Bits

■ Function Sets the TS data of NORMAL slot in the GSM and PCN systems.
(When the burst function unit is supported, this function is available)

Header	Program command	Query	Response
TS	TS␣a	TS?	TS␣a

■ Value of a #H000000 to #H3FFFFF (Hexadecimal number)
■ Suffix code None
■ Initial setting #H0970897
■ Example TS␣#H0AAABBB

4. SAMPLE PROGRAMS

This section describes some sample programs with the common commands and the program commands, queries, and response messages specific to the MG0302A.

4.1 Generating GSMK Modulation Signal

< Example 1 > Sets the frequency to 800MHz, output level to 0dBm and communication system to GSM.

```
10  '------------------------------
20  ' MG3670B GPIB SAMPLE PROGRAM
30  ' OUTPUT GMSK MODULATION
40  '------------------------------
50  ISET IFC ..... Initializes the interface function
60  ISET REN ..... Sets remote enable to TRUE
70  CMD DELIM=0 ..... Selects CR + LF as the delimiter
80  LET DSG=1 ..... Assigns MG3670 series • MG3660A address to variable DSG
90  PRINT @DSG;"PRE" ..... Initializes MG3670 series • MG3660A
100 SRQ ON ..... Permits the receipt of SRQ
110 PRINT @DSG;"*CLS" ..... Clears Status Byte Register
120 PRINT @DSG;"*SRE 4" ..... Masks bits other than SRE bit 2
130 PRINT @DSG;"ESE2 4" ..... Masks bits other than ESE2 bit 2
140 PRINT @DSG;"MOD ON" ..... Turns modulation on
150 PRINT @DSG;"MODE INT" ..... Sets the I,Q signals source to internal input
160 PRINT @DSG;"SYS GSM" ..... Sets the communication system to GSM
170 PRINT @DSG;"BST ON" ..... Turns the burst function on
180 PRINT @DSG;"PAT TCH" ..... Sets the standard internal modulation data to TCH
190 PRINT @DSG;"FREQ 800MHZ" ..... Sets the frequency to 800 MHz
200 PRINT @DSG;"OLVL 0DBM" ..... Sets the output Level to 0 dBm
210 POLL DSG,N ..... Performs serial polling
220 IF N<>68 THEN GOTO 210 ..... Exit from loop when STB ESB(bit 2) is 1
230 END
```

Lines 140 and 150 turns the modulation on and sets the I,Q signals source to internal input.
Lines 160 to 180 sets the communication system to GSM, turns the burst function on,and sets the standard internal modulation data to traffic channel.
Lines 190 and 200 sets the frequency and output level.
Lines 210 and 220 check that setting parameter has completed.

4.2 Setting the Internal Modulation Data

<Example 2> Sets the internal modulation data in the GSM system.

```
 10  '------------------------------
 20  ' MG3670B GPIB SAMPLE PROGRAM
 30  ' PATTERN EDIT (GSM)
 40  '------------------------------
 50  ISET IFC
 60  ISET REN
 70  CMD DELIM=0
 80  LET DSG=1
 90  PRINT @DSG;"PRE"
140  PRINT @DSG;"MOD ON"
150  PRINT @DSG;"MODE INT"
160  PRINT @DSG;"SYS GSM" ..... Sets the communication system to GSM
170  PRINT @DSG;"BST ON" ..... Turns the burst function on
180  PRINT @DSG;"PAT TCH" ..... Sets the standard internal modulation data to TCH
190  PRINT @DSG;"SLOTNO 1" ..... Sets the slot number to 1
200  PRINT @DSG;"SLOT ON" ..... Sets the slot 1 to NORMAL
210  PRINT @DSG;"TCH PN15" ..... Sets the TCH data of slot 1 to PN15
220  PRINT @DSG;"TS #H3FFFFF" ..... Sets the TS data of slot 1 to 3FFFFFF(Hexadecimal number)
230  END
```

Lines 160 to 180 set the communication system to GSM, turns burst function on, and sets the standard internal modulation data to TCH.

Line 190 sets the slot number to 1.
Line 200 sets the slot 1 to NORMAL.
Lines 210 and 220 set the E data of slot 1 to PN15, and the TS data of slot 1 to 3FFFFFF(Hexadecimal number).

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